D
PART II

of the '765 patent: the donor strain MG442, the recipient strain VL334, and two product strains, VL334(pYN6) and VL334(pYN7). These strains are further identified by the registration numbers given them by the Central Museum, as follows:

Strain	Registration No.
MG442	CMIM B-1628
VL334	CMIM B-1641
VL334(pYN6)	CMIM B-1649
VL334(pYN7)	CMIM B-1684

68. During the prosecution of four patent applications submitted by Ajinomoto prior to its acquisition of the '765 patent, the PTO Examiners specifically found that the strains were available to the public. (PX 223 at 89) The PTO Examiners also found the '765 patent to be enabled without the required deposits:

> Moreover, and in any case, the teaching in [the '765 patent] is considered [*60] sufficient to enable the ordinary skilled artisan to practice the ['765 patent] **even where the specific mentioned starting microorganism and host microorganisms are not available**. Analogous microorganisms are well known and access thereto is readily available.

(PX 218 at 100-01) (emphasis added).

> [The '765 patent] provides an adequate disclosure for one skilled in the art to practice the invention **whether or not the microorganism is available** and applicants have not shown that it is not. In order to practice the invention of [the '765 patent] to make any amino acid, one skilled in the art could use any mutant which has the characteristics disclosed by the patent and successfully produce amino acids.

(PX 222 at 139) (emphasis added); (PX 219 at 119-20).

69. Dr. Rudolph testified that dependent claims 3 and 4 were enabled without deposits. (D.I. 314 at 1115-16)

70. **The Degussa Inquiry**. On March 3, 1994 Degussa, a German company that competes with Ajinomoto and ADM in the threonine industry, wrote to Genetika inquiring about the formal requirements that must be fulfilled and the fees required to obtain various bacterial strains, including [*61] VL334(pYN7). (D.I. 315 at 1376-79; DX 88 at 25386) This inquiry did not conform with the Budapest Treaty on the International Recognition of the Deposit of Microorganism for the Purpose of Patent Procedure. n24

> n24 The Budapest Treaty on the International Recognition of the Deposit of Microorganism for the Purpose of Patent Procedure governs the proper method of making a biological deposit, the accepted depositories, and the proper procedures to be followed for requesting a deposit. With respect to the United States, the Budapest Treaty entered into force on August 19, 1980. (D.I. 98, Ex. 1) The former Soviet Union did not join the Budapest Treaty until April 22, 1981. (D.I. 98, Ex. 1) The strain VL334(pYN7) was deposited in 1978. (DX 156 at 58, 125)

According to Dr. Paraskevov, if Genetika received a request for deposited threonine-producing strains that conformed with the Budapest Treaty, it was obliged to supply the strain without first contacting Ajinomoto. (DX 1118 at 48-53) However, if the request was non-conforming, then Genetika would consult with Ajinomoto because Ajinomoto had the exclusive rights to the strains. (DX 1118 at 48-53)

[*62]

71. In accordance with Genetika's agreement to provide Ajinomoto with information on contacts between Degussa and Genetika, for which Genetika was paid $20,000, Genetika's Dr. Paraskevov informed Yoshikazu Takayanagi, then section manager of Ajinomoto's Patent and Licensing Department, of the request. (D.I. 315 at 1359, 1376-79; DX 88) In a letter dated March 18, 1994, Mr. Takayanagi told Dr. Paraskevov that he believed Dr. Paraskevov to be "under no obligation to provide [] such strains to Degussa . . . because these strains of Degussa's request are not the subject matters of German patents." (D.I. 315 at 1383; DX 89 at 1) In addition, as was common practice between Ajinomoto and Genetika, Mr. Takayanagi provided Dr. Paraskevov with suggested language to use in response letters to Degussa:

> Meanwhile please respond to Degussa as follows:
> "We duly received your letter of March 2, and March 16, 1994, now we are consulting this matter with Russian Ministry of Technology and Science and Russian Patent Office, so [] please give us a few weeks for our definitive reply to you[.]"
>
> And a few weeks later you will send the sec-

ond letter to Degussa indicating that: "Upon [*63] instruction of Russian Ministry of Technology and Science and Russian Patent Office, we regret to inform you that we are determined not to provide[] you with the strains of your request.

(D.I. 315 at 1383–85; DX 89 at 1) In a subsequent letter to Dr. Paraskevov dated June 8, 1994, Mr Takayanagi told him to "please send a refusing letter to Degussa. . . . We think the purpose of Degussa is to obtain strains from you under no obligation and to modify them to patent free strains for use by Biotika or Fermas." (DX 91)

When Degussa sent Genetika a request conforming to the Budapest Treaty on January 8, 1996, it was told it would receive the samples. (DX 167; DX 1118 at 43–44)

72. **The Pardo Inquiry**. In January 1994, Dr. Daniel Pardo of Eurolysine wrote to Genetika inquiring as to the procedure for ordering the bacterial strain B3996. (DX 168 at 3) No other strain was mentioned in the body of the letter. However, an attachment to the letter entitled "List of VNII Genetika E. coli strains" lists seven strains; item number 3 on this list is the strain VL334(pYN7). (DX 168 at 4) Listed as item number 7 is the strain B3996. (DX 168 at 4) Of the items listed, only this item [*64] has the notation following it: "Please confirm the availability of this strain since it was deposited for patent purpose . . ." (DX 168 at 4)

73. On January 26, 1994, Mr. Paraskevov sent Mr. Takayanagi a copy of Dr. Pardo's request, inquiring as to how Genetika should proceed. (DX 168 at 1) Mr. Takayanagi replied that Dr. Paraskevov had "no legal obligation[] to comply with the request of Dr. Pardo," advising Dr. Paraskevov to ignore the request for the moment. (DX 137 at 1; D.I. 315 at 1388) On February 4, 1994, Mr. Takayanagi reiterated to Dr. Paraskevov that he should "feel no responsibility to respond to or comply with the letter of Dr. Pardo dated January 21, 1994, unless or until you receive a[] official letter with a certificate of French Patent Office from him." (DX 95 at 1) Mr. Takayanagi went on to state that "among the strains of Dr. Pardo's request, the strain under international deposit is only VKPM B-3996, all other strains are domestic deposit under [U.S.S.R.] or Russian Laws, so that you will refuse to furnish him these strains citing appropriate Russian laws.' (DX 95 at 1)

74. Dr. Pardo's inquiry, also, did not conform with the Budapest Treaty. n25

n25 The court granted Ajinomoto's motion in limine "to exclude the testimony of and documents relating to Dr. Andrei Sibirny" and his request for strains. (D.I. 278 at P 5)

[*65]

G. The Role of relA in the Over Production of Threonine

75. The court has already recognized that "the best mode of practicing the *'765* invention requires that the bacterial host be characterized by the presence of a relA<+> gene." (D.I. 274 at 42) The specification does not explicitly characterize the bacterial host by the presence of a relA<+> gene or disclose the importance of this gene. (D.I. 274 at 42)

76. **The Relevance of the relA gene**. At the time of the invention, it was known to one of ordinary skill in the art that under conditions of amino acid starvation the operons of **certain** amino acids were positively regulated by the product of the wild type allele of the relA gene. (D.I. 314 at 1088–89; D.I. 316 at 1512; DX 326 at 660, 665; DX 305 at 668, 675)

77. The significance of the relA gene with respect to the synthesis of threonine was reported by some of the inventors of the *'765* patent in Genetika I and Genetika II, which were published at the time the *'765* patent application was filed. (DX 326; DX 305) Both publications discuss the relevance of the allelic state of the relA gene to the phenotypic expression of certain mutations in [*66] the threonine operon (thrA442) and the isoleucine-valine operon (ilvA) and the over synthesis of threonine. Each concludes that the operons controlling threonine and isoleucine synthesis are positively regulated by the product of the wild type relA gene and that under conditions of isoleucine deficiency, the wild allele of the relA gene has a positive influence on the over synthesis of threonine. (DX 305 at 675–76; DX 326 at 665–66) Thus, these publications disclose that the threonine operon is one of those amino acid operons the transcription of which is stimulated by the product of the wild type relA gene. It is undisputed that not all E. coli strains have the relA<+> gene. (D.I. 313 at 996; D.I. 316 at 1533)

According to Dr. Rudolph, one of ordinary skill in the art being familiar with the literature, particularly the Debabov article and Genetika I and II, would have been able to determine the best mode of practicing the *'765* invention. (D.I. 314 at 1088) Dr. Falkinham goes one step further concluding that one of ordinary skill in the art would have known that relA<+> is required to practice the claimed invention. (D.I. 316 at 1512)

78. **The Presence** [*67] **of relA<+> in Leaky Auxotrophs**. According to Genetika I and II, "introduction of the relA mutation into the genome of semiauxotrophic strains with respect to threonine and isoleucine

leads to the appearance of a strict dependence of their growth on the presence of those amino acids in the medium." (DX 326 at 665; DX 305 at 675) Through a series of experiments, the researchers concluded that the effect of the relA<-> gene on a leaky auxotroph is to make it a complete auxotroph. (D.I. 313 at 993; D.I. 314 at 1090; D.I. 316 at 1533-38; D.I. 317 at 1638, 1643-44; DX 305; DX 326) Therefore, as reiterated by Dr. Falkinham, the literature supports a finding that the relA<+> gene is inherently present whenever a leaky mutation is obtained. (D.I. 316 at 1512, 1515)

79. The inventors of the *'765* patent disclosed the preparation of strains VL334(pYN6) and VL334(pYN7), the only strains at the time of the *'765* patent application reduced to practice. It is undisputed that the parent strain of VL334 is MG442, a relA<+> strain. (D.I. 313 at 992-93; D.I. 314 at 1091) According to Dr. Falkinham, in the absence of any indication that there was a change in the allelic state of the [*68] relA gene, one skilled in the art would conclude that VL334 was also relA<+>. (D.I. 316 at 1512, 1540-41)

80. **Bacterial Strain Nomenclature**. According to Dr. Falkinham, the general practice in describing the genetic characteristics of bacterial strains is to list only mutations of genes; thus, anyone skilled in the art reading the specification of the *'765* patent would know, since none of the recipient strains contain the relA gene in their description, that the strains are relA<+>. (D.I. 316 at 1540-41) This "practice" is not followed by the inventors to the extent that they did not disclose in the *'765* patent the supE gene (the amber mutation), a common mutation in the early strains of E. coli K-12, even though it is mutated in VL334. (D.I. 316 at 1575; DX 305 at 669; DX 326 at 661) Therefore, it cannot be concluded that the allelic state of the relA gene was disclosed through the nomenclature employed in the *'765* patent.

H. Genetika's Threonine-Producing Bacterial Strains

81. According to the *'765* patent, the plasmid pYN7 is constructed from either pYN6 or pYN10 using the *'765* process. Either plasmid is treated with specific endonuclease [*69] followed by treatment with a polynucleotide ligase. (JX 1 at col. 10, lines 17-22) The resulting preparation is used for transformation, and clones with a specific phenotype are selected. (JX 1 at col. 10, lines 22-25) The plasmid with molecular weight 5.7 megadaltons (Md), n26 pYN7, was isolated from an arbitrarily selected clone. (JX 1 at col. 10, lines 25-27) This hybrid plasmid is composed of two fragments, the greater portion corresponding to the plasmid pBR322 and the other a fragment of DNA chromosome of the strain MG442 containing all of the genes of the threonine operon. (JX 1 at col. 10, lines 27-36) The plasmid pYN7 is used for transformation of the strain E. coli VL334, which has mutations in the thrC gene and the ilvA gene capable of blocking synthesis of L-threonine and an adjacent pathway of L-threonine metabolism. (JX 1 at col. 10, lines 36-42) The resultant strain, VL334(pYN7), is resistant against penicillin and capable of growing on a medium without amino acids. (JX 1 at col. 10, lines 43-48) In each cell, there are approximately twenty copies of the pYN7 plasmid. (JX 1 at col. 10, lines 49-51)

> n26 This conflicts with the information provided in the Russian priority patent, where the molecular weight of the plasmid pYN7 was set forth as 7.1 Md. (PX 2 at 92)

[*70]

82. After constructing VL334(pYN7), Genetika continued to conduct research aimed at constructing threonine-producing strains. By 1979, the Genetika inventors developed the bacterial strain M1(pYN7). The inventors obtained U.S. Patent No. *4,321,325* ("the *'325* patent") entitled "Process for Producing L-threonine," for the method of producing threonine using the M1(pYN7) strain. (DX 61) M1(pYN7) was not made by using the process claimed in the *'765* patent. Rather, M1(pYN7) was selected on the basis of the natural variability of VL334(pYN7) by "being inoculated to an agar-doped culture medium." (DX 61 at col. 3, lines 14-17, 45-46) The strain M1(pyN7) was isolated by selecting for colonies able "to produce L-threonine on a minimal glucose-salt nutrient medium and to retain the plasmid in the course of fermentation." (DX 61 at col. 3, lines 47-51) The location of the mutation, whether on the plasmid or on the chromosome and the specific gene affected, is unknown. (D.I. 308 at 274-76; D.I. 313 at 968-70) M1(pYN7) differs from VL334(pYN7) in, inter alia, having greater stability and an increased threonine-producing capacity (the average rate of accumulation of threonine by M1(pYN7) being [*71] five times greater than that of VL334(pYN7) and M1(pYN7) producing 50% more threonine than did VL334(pYN7)). (DX 61 at col. 4, lines 28-53; col 6, lines 28-31) It is undisputed that M1(pYN7) and VL334(pYN7) are different strains. (D.I. 308 at 319; D.I. 313 at 969-70)

83. The Genetika inventors continued their research using the M1(pYN7) strain. In 1992, the inventors obtained U.S. Patent No. *5,175,107* ("the *'107* patent"), entitled "Bacterial Strain of Escherichia Coli BKIIM B-3996 as the Producer of L-threonine." (DX 15) The *'107* patent covers the bacterial strain of E. coli BKIIM B-3996 as the producer of L-threonine. In setting forth a method of constructing B-3996 from M1, the *'107* patent made ref-

erence to an intermediate strain, G472T23. (DX 15 at col. 2, lines 26–31) G472T23 was made through a two-step process: (1) transduction of M1 by a bacteriophage bearing a determinant of saccharose assimilation, followed by (2) selection of spontaneously arisen mutants. (DX 15 at col. 2, lines 14–26) The G472T23(pYN7) strain was isolated as one of the mutant strains. G472T23(pYN7) is described in the *'107* patent as a spontaneously arising mutant variant of M1 that is capable of "utilizing [*72] saccharose and saccharose-bearing substrates, such as molasses, as a source of carbon" and is resistant to both L-threonine and L-homoserine. (DX 15 at col. 4, lines 14–21, 29–31) The strain is auxotrophic for threonine, has a leaky mutation for isoleucine synthesis, and has an amplifiable plasmid containing a chromosomal fragment bearing the threonine operon. (D.I. 307 at 136) The strain also produces 53 g/l of threonine as compared to 20 g/l for VL334(pYN7). (PX 977 at 26–27; JX 1 at col. 11, lines 50–61) It is undisputed that the strains G472T23(pYN7) and M1(pYN7) are different. (D.I. 308 at 319; D.I. 313 at 975)

I. Genetika's Assignment of the *'765* Patent to Ajinomoto

84. The rights embodied in the *'765* patent were granted to the fourteen named inventors pursuant to the laws of the United States. (PX 2 at 1) Plaintiff asserts that, because the invention was made by the inventors in the course of their employment at Genetika, an institution of the Soviet state, the rights in the *'765* patent became the property of the Soviet state. (D.I. 196 at ex. 5 at PP 24, 26, 27, 40, 44, 62, 103, 108) Ajinomoto did not offer into evidence any assignments of the *'765* patent from the named [*73] inventors to Genetika or any of its predecessors-in-interest. n27

> n27 A purported confirmatory assignment from the inventors to Ajinomoto (PX 385), which was filed in the PTO to protect Ajinomoto against subsequent assignments under *35 U.S.C. § 261*, was on Ajinomoto's evidence list but was never offered into evidence.

85. On July 21 1982, Ajinomoto entered a license agreement with Licensintorg, the Soviet government's technology licensing entity, granting Ajinomoto the exclusive U.S. rights to the *'765* patent. (PX 3; D.I. 311 at 668–69; D.I. 312 at 907–08) The agreement stated that "the Licensor[, Licensintorg,] is entitled by the Author[, Genetika,] to negotiate." (PX 3) Specifically, the agreement granted Ajinomoto the "exclusive right to use the [*'765*] patent, know-how, technical documentation and strain [G472T23(pYN7)] for the production, use and/or sale of the licensed product[, L-threonine produced by the method employing G472T23 as developed by Genetika,] in Japan and the U.S. (PX 3 § 2.1(a)) [*74] Additionally, Ajinomoto received strain G472T23(pYN7), which had been developed and was owned by Genetika. (PX 3 at 3538, 3562)

86. In 1987, Licensintorg was succeeded by Medexport, another Soviet government agency. (D.I. 311 at 668–89; PX 6; PX 9)) All rights and obligations of Licensintorg under the license agreement were transferred to Medexport. (PX 10)

The license agreement was amended in both December 1989 and December 1990. (PX 6; PX 9) The latter addendum between Ajinomoto and Medexport granted Ajinomoto

> an exclusive right to use the strain E. coli VNIIGenetika 4272T-23, PATENTS, TECHNICAL DOCUMENTATION and KNOW-HOW, concerning this strain to manufacture, use and sell the LICENSED PRODUCT on the base of this strain throughout the whole world except for the [U.S.S.R.], Czechoslovakia, Belgium, Denmark, Finland, Germany, Holland, Iceland, Luxemburg, Norway, Sweden.

(PX 9 § 2(c))

87. In January 1991, all rights and obligations of Medexport under the license agreement and addendums 1 and 2, including the *'765* patent, were transferred from Medexport to Genetika, the legal successor of Medexport. (PX 15; D.I. 311 at 665–71; D.I. 312 at 907–08)

88. Effective [*75] May 14, 1991 Genetika assigned and transferred to Ajinomoto "all rights, title and interest" to the *'765* patent. (JX 4) In August 1994 this agreement was amended to reflect a change in the royalty payment. (JX 5)

89. In a memorandum to Genetika concerning the measures to be taken against ADM for alleged infringement, Ajinomoto stated that "there remains a succession certification procedure problem from Licensintorg." (DX 116 at AJ_FRFT008415)

J. Genetika's License of the Strain G472T23(pYN7) to A.C. Biotechnics

90. **The License.** On or about September 9, 1986, Licensintorg granted a license to use G472T23 to A.C. Biotechnics, ABP International AB's ("ABP") predecessor. (JX 6) This agreement expressly granted ABP "the exclusive right to use the licensed strain, knowledge and

patents for the purpose of manufacturing of L-threonine in the territory [—Belgium, Denmark, Finland, FRG, Holland, Iceland, Luxemburg, Norway, and Sweden—] and the non-exclusive right to use and sell L-threonine, thus produced, in the territory and the zone of non-exclusive right[, worldwide but for the U.S.A. and Japan.]" (JX 6 §§ 1.6, 1.5, 2.1) In addition the agreement granted ABP "the right [*76] to grant sub-licenses hereunder to third parties limited as said in article 2.1." (JX 6 § 2.4) ABP was required to keep Licensintorg informed of any sub-licenses and the rights assigned to the sublicensees. (JX 6 § 2.4) The agreement also provided that the parties were to "inform each other of all improvements and modifications," made to the licensed strain and that the "terms of transferring such improvements and modifications [were] to be agreed upon between the parties in each separate case," (JX 6 § § 8.1, 8.2).

91. **The Construction of ABP's Strain G472T23(pYN8).** ABP constructed the strain G472T23(pYN8) from G472T23 (pYN7), which it received from Genetika. ABP used the plasmid pYN7, which had an incomplete (i.e., defective) tetracycline resistant gene, from strain G472T23 in constructing the plasmid pYN8. According to expert testimony and the "owner's manual" n28 (PX 35), ABP isolated the plasmid pYN7 and cut it using restriction endonucleases so as to isolate the chromosomal DNA fragment containing the threonine operon. (D.I. 307 at 165-66; D.I. 313 at 978079) The remaining plasmid DNA, an incomplete copy of pBR322, was removed and discarded and thus was not used [*77] to form pYN8. (D.I. 307 at 165-66)

n28 The manual was provided to ADM by ABP when it purchased the strain.

92. According to the genealogy set forth in the record, the feedback resistant threonine operon (mutation in thrA) in pYN7 was chromosomal DNA obtained from donor strain MG442. (PX 35 at 2393; PX 966 at 36; D.I. 307 at 126-131) ADM contests this assertion, arguing that the evidence indicates that the descendant pYN7 plasmid differs genetically and structurally from the original pYN7 plasmid and thus the chromosomal fragment found in pYN8 is neither structurally or genetically the same fragment initially isolated from the donor bacterial chromosome. (D.I. 325 at 25-26)

It is undisputed that the strains M1(pYN7) and G472T23(pYN7) were not constructed using the method set forth in the *'765* patent, but were the result of spontaneously occurring mutations, the number and location of which were unknown. It is also undisputed that each subsequent strain was improved in its ability to produce threonine over [*78] the parent strain from which it was derived. Although the plasmid maps depicting the pYN7 plasmid in the *'765* patent (JX 1 at Fig. 5), the Russian priority document (PX 2 at 56), the *'107* patent (DX 15) and the ABP manual (PX 35 at 2390) all vary with respect to the size of the plasmid in terms of megadaltons or kilobases, the maps are the same in terms of the restriction sites. (D.I. 308 at 294) Moreover, the maps do not indicate any change in the structure of the threonine operon or its origin. In fact, in its submission to the Japanese Ministry of Agriculture, Forestry and Fisheries, ADM represented that the threonine operon in pYN8 was "E. coli chromosome fragments" that were derived from the donor strain MG442. (PX 321 at 2754-55)

93. It is undisputed that the asd gene, which catalyzes the second step of threonine synthesis, was not present on the chromosomal fragment used by ABP to construct pYN8. (D.I. 307 at 137-38, 140, 156-57, 159, 161; D.I. 308 at 186, 187-89, 322-24; D.I. 313 at 979-80, 986-87, 943-44)

94. The isolated chromosome fragment from pYN7 was then ligated with plasmid DNA (pBR322) bearing a replacement tetracycline resistant gene and a spacer DNA fragment [*79] from plasmid pSGS18. (PX 35 at 2391, 2394; PX 63 at 1655; DX 498) The resultant hybrid plasmid, pYN8, contained an operating ampicillin resistant gene, an operating tetracycline resistant gene, and spacer DNA; the latter two items not being found in pYN7. (PX 35 at 2394; PX 977 at 25) Plasmid pYN8 had a length of 11.5 kilobases (kB), (PX 35 at 2391), as compared to pYN7 which had a length of 10.4 kB, (PX 35 at 2390).

95. The hybrid plasmid, pYN8, was used to transform the host strain, G472T23. According to the ABP manual, plaintiff's expert, and the genealogy presented in the record, G472T23 was a mutant strain of E. coli K-12 that was auxotrophic for threonine by a mutation in the thrC gene and was partially blocked in threonine metabolism by a mutation in the ilvA gene. (PX 35 at 2393, 2396-97; PX 966 at 28-29, 31; D.I. 307 at 151-156) The resultant strain, G472T23(pYN8), possessed an increased productivity of threonine, producing 80-90 g/l of threonine versus 53 g/l for G472T23(pYN7) and 20 g/l for VL334(pYN7). (JX 1 at col. 11, lines 50-61; PX 966 at 31; PX 977 at 26-28; D.I. 308 at 217, 221; D.I. 307 at 158-60, 162; D.I. 314 at 1128-29, 1145, 1150)

96. ADM contends [*80] that the strains it obtained from ABP do not have the ilvA leaky mutation as evidenced by the fact that, in order to maximize threonine production, ADM has added isoleucine in one form or another to its threonine seed fermenters since it began the commercial production of threonine. (D.I. 316 at 1472-74) According to the ABP manual, however, the fact that

G472T23 has the leaky ilvA gene decreases the strain's ability to produce isoleucine and, therefore, there is a need for an addition of isoleucine. (PX 35 at 2396-97) In addition, Mr. Steven F. Stoddard, a group leader in ADM's Research Division, testified that the cells do grow, albeit poorly, without isoleucine present in the medium, indicating that the cells are not isoleucine auxotrophs. (D.I. 312 at 844-45) Moreover, inter-office memoranda indicate that in early 1993, ADM was attempting to make G472T23 prototrophic for both threonine and isoleucine. (PX 76; PX 75)

K. ADM's Search for Threonine-Producing Technology

97. In late 1988, ADM's Robert Dworschack conducted a literature and patent search to identify organizations involved in amino acid research, particularly research dealing with lysine, because ADM intended [*81] to enter the amino acid business. (PX 965 at 10-11) During this search, Dworschack became aware of Genetika's amino acid research and its corresponding patents, including a patent of threonine technology. (PX 965 at 11-13)

98. On November 2, 1988, ADM's Jack Reed, John Long, and Dworschack visited the Genetika facilities to inquire about amino acid producing technology, particularly a lysine producing organism. (D.I. 312 at 881) While there, ADM was informed that Genetika had the "world's best organism for producing threonine." (D.I. 312 at 881) At that time, ADM was not interested in a threonine producing bacterial strain. (D.I. 312 at 882)

99. Also in 1988, ADM began working with Eastman Kodak Company ("Kodak") on developing amino acid technology, particularly lysine, threonine, and tryptophan. (D.I. 312 at 758, 771-74; PX 136; PX 317). In June 1989, ADM entered into an agreement with Kodak whereby it purchased Kodak's technologies. (D.I. 312 at 773-74) The purchase price for the technology was $21 million. (PX 317) At the time of purchase, these technologies were not commercially viable; therefore, work continued on their development. (D.I. 312 at 774) In a subsequent amendment [*82] to the June agreement between Kodak and ADM, ADM commissioned Genencor, Kodak's successor, to conduct $1 million worth of research and development for threonine and/or biotin in each of years 1991 and 1992. (PX 142; PX 317) On June 29, 1991, ADM extended the research agreement through December 1991 for approximately $1 million because "the technical breakthrough that [ADM] had hoped for" had not occurred although ADM "continued to be confident that threonine [was] still a commercially viable project." (PX 143; PX 359)

100. On April 25, 1989, ADM publicly announced its plan to enter the commercial amino acid market during the first quarter of 1990, building a new facility in Decatur, Illinois for the manufacture of lysine, tryptophan, and threonine. (PX 131) Subsequently, ADM's start date for the production of tryptophan and threonine was changed to 1991. (PX 140; PX 139)

101. In June 1989, ABP contacted ADM to offer its technology for the industrial fermentation of tryptophan, citric acid, and threonine. (DX 448) ADM did not respond to ABP's invitation to discuss the technologies. (PX 977 at 77-79)

102. In August 1989, ADM commenced construction of its bioproducts facility [*83] in Decatur, Illinois. (D.I. 312 at 805-06, 808) By October 1991, the amino acid technology was commercially viable, and ADM began to modify its facilities to begin production of threonine using the Kodak strain. (D.I. 312 at 774, 809-10)

103. On January 30, 1990, ADM's Reed, Dworschack, and Stauffer revisited Genetika's facilities in order to discuss threonine technology. (D.I. 312 at 886-87, 903) At that meeting, Dr. Debabov informed the ADM representatives that Genetika had licensed the threonine producing organism to a Japanese company "which was located somewhere in the middle west of the United States." (D.I. 312 at 888; PX 965 at 37; JX 13 at AD001588-1589) Either at that meeting or shortly thereafter, ADM deduced that the Japanese company was Ajinomoto. (D.I. 312 at 892, 904-06; PX 965 at 37-39)

104. Stauffer and Dworschack had detailed technical discussion with the Genetika representatives. (D.I. 312 at 906) Based on the technical information obtained, Dworschack determined that the Genetika technology should be pursued. (D.I. 312 at 906) ADM suggested to Genetika that it consider having ADM's Russian counsel review the Genetika-Ajinomoto agreement to establish whether Genetika [*84] was prohibited from making a threonine organism available to ADM. (D.I. 312 at 909-10) Genetika did not respond to ADM's suggestion until ADM raised the question again later on. (D.I. 312 at 907)

105. Following the trip to Genetika, Stauffer and Dworschack prepared trip reports. In his report to Long, Stauffer stated:

> As you are aware by now, Genetika has a patent on their Escherichia coli strain, and has sold the rights to a Japanese company for exclusive use in the U.S. This contract extends from 1986 to 2003. The company has not used the strain to their knowledge. They could not remember the company (this

> is hard to believe), but said it was located in the midwest.

(JX 12) Stauffer went on to describe the advantages of the Genetika strains. (JX 12)

In his report to Long, Dworschack reported that:

> [Debabcv] then proceeded to tell us that an exclusive license to produce threonine only in the United States was given to a Japanese company (no name). . . . Maybe the Japanese are not showing good faith in fulfilling the contract and, as a result, the agreement can be broken.

(JX 13)

106. Subsequently, ADM contacted Degussa, BASF and Genencor to [*85] discuss threonine technology. (PX 965 at 27) Nothing came from these discussions. (PX 965 at 27–28)

107. In March 1992, Reed returned to Genetika to establish beyond question whether Genetika was legally prevented by the Genetika–Ajinomoto agreement from providing ADM with the threonine producing organisms. (D.I. 312 at 907; PX 54; PX 976 at 78–83) Genetika asserted that they were unable to furnish ADM such strains, including any "stepping stone" versions thereof, due to its licensing agreement with Ajinomoto. (PX 165) However, Genetika allowed ADM's Russian attorney to review the agreement to determine if Genetika was legally bound by it and thereby prohibited from making a threonine organism available to ADM. (D.I. 312 at 909–10; PX 165; PX 976 at 82) After May 1992, ADM had no further contact with Genetika (D.I. 312 at 910–11)

L. ADM's Purchase of ABP's Threonine-Producing Technology

108. In January 1992, ABP received the opinion of a Swedish patent agent counsel regarding whether plasmid pYN8 developed by ABP from the Genetika microorganism was outside the Genetika–ABP agreement. (DX 966) The attorney concluded that, in light of U.S. patent *4,321,325* covering the plasmid [*86] pYN7, pYN8 (containing genes for resistance to both ampicillin and tetracycline) could not be used commercially for L-threonine production "all over the world." (DX 966) The attorney went on to opine that if the gene for ampicillin resistance were removed from pYN8 there would be no "obstacle" with respect to the contract or current patent protection. (DX 966) This opinion does not relate to the *'765* patent.

109. In June 1992, ABP contacted ADM about ABP's threonine technology. (D.I. 312 at 774–75; PX 976 at 105–08; PX 963 at 30; PX 980 at 31–33; PX 977 at 79–82; JX 7) ABP's offer to ADM included not only the strains, but also "a total operating manual for threonine, which starts with the strains of fermentation process that produced threonine and each of the purification steps." (D.I. 312 at 778–79)

110. ADM was aware of the Genetika patent and that ABP's organisms were derived from the Genetika microorganism when it entered into negotiations with ABP. (PX 976 at 105–08) It is undisputed that at no time prior to or after purchase of the strains from ABP did ADM seek an opinion of counsel regarding infringement of the *'765* patent. ADM relied instead on statements made by ABP that [*87] it had the right to offer the strains for sale. (PX 964 at 230–31)

111. In November 1992 ADM entered into an agreement with ABP for the acquisition of ABP's threonine technology. (D.I. 312 at 779, 788–89) The purchase price was $3 million. (D.I. 312 at 778–89; PX 36) As part of the agreement, ADM acquired all of ABP's rights to the process for the production of threonine of feed grade quality, the strain process documentation, and the specification of the technical requirements that were to be satisfied in the design and construction of a plant producing threonine using the designated process. (JX 14; D.I. 312 at 778–89; PX 36)

112. The strains purchased by ADM were G472T23(pYN8) and G472T23(PKYN1108:6), both of which had been developed by ABP.

113. In December 1992, ADM commenced commercial production of threonine at its Decatur plant using G472T23(pYN8). (PX 921; PX 412) Production with G472T23 continued until approximately September 1994. (PX 412; PX 921)

114. In January 1992, in response to questions posed by ADM regarding the patent-status of G472T23 and G472T23(pYN7), Dr. Harold Skogman, ABP's Managing Director, stated that:

> The strain G472-T23 was derived by inserting [*88] Suc<+> into the original VL 334 and selecting for spontan[]eous mutants capable of growing on a minimal medium containing threonine (5 mg/ml).
>
> The US patents *4,321,325* and *4,278,765* only mention VL 334 (and VL 334/pYN7) which, as described above, is not the same as G472-T23.

(PX 967 at 2) In addition, ABP reiterated the findings of outside patent counsel that

> the plasmid pYN8, which has both ampicillin and tetracycline resistance would have to be further modified, to be different from pYN7 as described in US Patent *4,321,325*. The Claims of this patent define a plasmid, which gives penicillin resistance. One way to avoid these claims would be to remove the gene for penicillin resistance.

(PX 967 at 3) Skogman stated that ABP was not aware of any patent the Japanese may have obtained on the production of threonine with the Genetika microorganism. (PX 967) Genetika never informed ABP that it had granted an exclusive license to Ajinomoto for threonine production. (PX 977 at 92-93)

115. On January 26, 1993, ADM requested that ABP make further bacterial strains by modifying the ABP plasmid. (PX 39) Specifically, ADM requested the removal of the ampicillin [*89] gene from pYN8, leaving the organism resistant to tetracycline only. (PX 39) It was ADM's understanding that "the stability of the modified organism [would] be the same as the unmodified organism and the threonine production and yield [would] be the same." (PX 39)

According to ADM there are benefits to using a strain which is not ampicillin resistant. First, it avoids the potential transfer of ampicillin resistance to other microorganisms. (D.I. 314 at 1133-34; PX 977 at 38-39) Second, the use of ampicillin on an industrial scale can pose health problems. (D.I. 314 at 1133-34) By taking precautions to prevent contamination, ADM reduces the risk posed by a potentially dangerous release. (D.I. 312 at 759-61)

116. In response to ADM's request, ABP constructed two plasmids: pYNSTOP and pYNTE2. To construct pYNSTOP, plasmid pYN8 was subjected to restriction digestion with the restriction enzyme PstI, thereby opening up the pst site in the amp<R> gene. (D.I. 308 at 174-76, 180-81, 197-99; D.I. 313 at 982-83; DX 499; PX 35; PX 63) Then synthetic linker DNA possessing stop codons was inserted to disrupt the ampicillin resistant gene. (D.I. 308 at 174-76, 180-81, 197-99; D.I. 313 [*90] at 982-83; DX 499; PX 35; PX 63) The resultant hybrid plasmid, pYNSTOP, was used to transform the host strain G472T23. (D.I. 308 at 181-82; 218-19, 221; D.I. 314 at 1131, 1150) Unlike G472T23(pYN8), which has functional amp<R> and tet<R> genes, the bacterial strain G472T23(pYNSTOP) has a functional tet<R> gene but a non-functional amp<R> gene. (D.I. 313 at 982-83; DX 499) In addition, it's yield n29 is 33.7% versus 32.9% for G472T23(pYN8), and it accumulates threonine at a rate n30 of 510 lbs/fermenter/hour versus 448 lbs/fermenter/hour for G472T23(pYN8). (D.I. 312 at 831-32; D.I. 316 at 1491)

> n29 "Yield" refers to the number of grams of threonine that a strain can produce from 100 grams of dextrose. (D.I. 312 at 830) Because dextrose is an expensive component of the fermentation process, any increase in yield results in an increase in profit margin. (D.I. 312 at 834) Because a variety of factors such as the quality of the corn steeped liquor used in the medium, the presence of contaminants, water quality, and operator judgments affect the yield, there is "a lot of noise in the data" and thus a wide variation between runs. (D.I. 316 at 1474-77, 1479)
>
> ADM's expert Julie Davis concluded from her analysis of the data supplied by ADM that the strains used by ADM were comparable in performance. (D.I. 315 at 1324-25)

[*91]

> n30 Rate of threonine accumulation measures the accumulation of threonine in terms of the weight of threonine accumulated per volume over time. Although Genetika used this parameter to compare the performance of M1(pYN7) to VL334(pYN7) in the '*325* patent (DX 61 at col. 6, line 38-col. 7, line 12), the record indicates that this parameter was not recorded by ADM or used by ADM to compare fermentation runs; rather the values appear transitorily on an "operator screen" and are used only to determine when it is time to finish a run. (D.I. 316 at 1501-02) Thus, it appears that ADM derived this parameter in the middle of litigation solely for purposes of trial. (D.I. 316 at 1492) This information, therefore, was not relied upon by ADM when comparing the strains during the actual production runs in ADM's facilities. (D.I. 316 at 1492)

It is undisputed that pYNSTOP is "different" from pYN8. Dr. Falkinham stated that because pYNSTOP and pYN8 differ with respect to restriction map and size, pYNSTOP is a "different unique plasmid" than pYN8, (D.I. 308 at 317), while Dr. Rudolph found the two plasmids to [*92] be "materially different," (D.I. 313 at 984-85).

117. Plasmid pYNTE2 was made by digesting the plasmid pYN8 and isolating the chromosomal DNA fragment containing the feedback resistant threonine operon, followed by the ligation of DNA linkers to the ends of the

threonine operon. (D.I. 313 at 985–86; PX 35 at 2394; PX 63 at 1655, 1657–58; DX 500) This chromosomal DNA fragment was then ligated to a DNA fragment with the gene for kanamycin resistance from the plasmid pK3CIC3 to yield the plasmid pKYN8. (PX 35 at 2394) The plasmid pKYN8 was then cleaved and the chromosomal DNA containing the threonine operon isolated. (D.I. 313 at 985–86; PX 35 at 2394; PX 63 at 1655, 1657–58; DX 500) This chromosomal fragment was then combined with a portion of the plasmid pBR322, from which the ampR gene had been removed but which retained the tetR gene, to yield the plasmid pYNTE2. (D.I. 313 at 985–86; PX 35 at 2394; PX 63 at 1655, 1657–58; DX 500) This plasmid was used to transform the recipient bacterial strain G472T23. The resultant bacterial strain has a yield of 34.2% to 37.4% and a threonine accumulation rate of 532 lbs/fermenter/hour. (D.I. 312 at 831–32; D.I. 316 at 1491; PX 968 at [*93] 32–33) In addition, it has a functional tet<R> gene while completely lacking a gene for ampicillin resistance. (D.I. 313 at 985–86; PX 35 at 2394; PX 63 at 1655, 1657–58; DX 500)

It is undisputed that pYNTE2 is "different" from pYN8. Dr. Falkinham stated that because pYNSTOP and pYN8 differ with respect to restriction map and size, pYNSTOP is a "different unique plasmid" than pYN8 (D.I. 308 at 317), while Dr. Rudolph found the two plasmids to be "materially different" (D.I. 313 at 988).

118. It is also undisputed that the basic utilities, i.e., the over production of threonine, of G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) are identical. (D.I. 314 at 1132–33, 1144)

119. The microorganisms constructed by ABP in response to ADM's request, G472T23(pYNSTOP) and G472T23(pYNTE2), were employed by ADM for threonine production from May 1993 until February 1995 and February 1996 until the present, respectively. (PX 921)

Production records indicate that at times the use of the strains in production overlapped. From May 1993 until February 1994, ADM employed both G472T23(pYN8) and G472T23(pYNSTOP). (PX 921) From February 1994 until September 1994, all three strains were in use. [*94] (PX 921) Then in approximately September 1994, ADM ceased production with G472T23(pYN8). In February 1995, production with G472T23(pYNSTOP) ceased. (PX 921) From that time until the present, ADM has employed only G472T23(pYNTE2) in its fermentation runs. (PX 921)

120. A memo dated March 31, 1993 and written by Dr. Paul Hanke, an ADM senior research scientist, indicates that ADM was "working on ways to stabilize the threonine plasmid," including inserting the serA gene into the "threonine plasmid." (PX 75) According to the memo, ADM was also trying to develop G472T23 as a host strain for a tryptophan plasmid and as such was attempting to make the strain double prototrophic for both threonine and isoleucine, but at that time had only been able to construct single prototrophic strains. (PX 75) The memo concluded by stating that:

> Either of the single prototrophic strains may be worth testing with the threonine plasmid (pYN8) as they might make the strain clear of the Russian's patent.

(PX 75)

121. In 1993, Dr. Debabov and Mr. Stepanov from Genetika met with Dr. Skogman of ABP. Prior to this meeting, Ajinomoto had informed Genetika that ABP had violated the Genetika–ABP [*95] agreement. (DX 1100 at 83–89, 91–92) During the meeting, in response to Dr. Debabov's inquiries, Dr. Skogman reported that ABP had sold "modified" versions of the Genetika microorganism along with the threonine technology. (DX 1100 at 83–89, 91–92; PX 977 at 93–96) Dr. Skogman offered no proof that the strain had been modified. (DX 1100 at 83–89, 91–92; PX 977 at 93–96) Dr. Debabov expressed his displeasure that the technology had been sold without notifying Genetika, but he did not pursue the matter further. (DX 1100 at 83–89; PX 977 at 93–96) Later, Dr. Debabov learned from Ajinomoto that the ABP technology had been sold to ADM. (DX 1100 at 83–89)

122. According to internal communications, Ajinomoto was aware of ADM's activities in the marketplace with respect to the threonine producing organisms acquired by ABP as early as January 1994. (DX 115, DX 116; DX 117; DX 118; DX 120) In fact, a telefax from Contifood AB to Eurolysine dated November 20, 1992 recounted the news report of ABP's sale of threonine technology to ADM. (DX 176) According to defendant, Ajinomoto did not contact ADM regarding its infringement claim until it filed suit in April 1995.

III. CONCLUSIONS OF [*96] LAW

A. Standing

1. As a threshold issue, ADM argues that Ajinomoto lacks standing to sue ADM for infringement of the *'765* patent because Ajinomoto has failed to establish that it has any ownership rights in the *'765* patent. Specifically, ADM avers that Ajinomoto has failed to offer into evidence an assignment of the *'765* patent from the named inventors to Genetika or any predecessors-in-interest of Genetika and, therefore, the chain of title from the inven-

tors to Ajinomoto was not established.

2. [HN2] Standing is a "threshold question in every federal case, determining the power of the court to entertain suit." *Pfizer Inc. v. Elan Pharm. Research Corp., 812 F. Supp. 1352, 1356 (D. Del. 1993).* The party invoking federal jurisdiction bears the burden of fulfilling the standing requirement. See *Lujan v. Defenders of Wildlife, 504 U.S. 555, 561, 119 L. Ed. 2d 351, 112 S. Ct. 2130 (1992); Ortho Pharm. Corp. v. Genetics Inst., Inc., 52 F.3d 1026, 1032-33 (Fed. Cir. 1995).* According to *35 U.S.C. § 281,* a civil action for infringement may be brought by a "patentee," *35 U.S.C. § 281* (1997), which is defined to "include[] not only the patentee to whom the patent was issued [*97] but also the successors in title to the patentee," *35 U.S.C. § 100*(d). Pursuant to *35 U.S.C. § 261,* patents, and any interests therein, are "assignable in law by an instrument in writing." *35 U.S.C. § 261.* An assignee of the rights under a patent is deemed the effective "patentee" under § 281 and has standing to bring suit in its own name for infringement. See *Ortho Pharm. Corp., 52 F.3d at 1030.* Thus, if Ajinomoto can prove that it was the assignee of the *'765* patent at the time suit was filed, Ajinomoto has standing to sue for patent infringement. See *GAIA Technologies, Inc. v. Reconversion Technologies, Inc., 93 F.3d 774, 777 (Fed. Cir. 1996).* Absent ownership of the *'765* patent, Ajinomoto lacks standing to sue on the patent. See id.

3. Rather than raise the issue at an earlier stage of the proceedings, ADM has raised the issue of standing for the first time in its post-trial brief. Although ADM denied in its answer to the complaint that Ajinomoto was the owner of the *'765* patent (ADM was "without knowledge or information sufficient to form a belief," (D.I. 8)) and refused to add to the statement of admitted facts that "Ajinomoto is the owner of the *'765* patent," [*98] Ajinomoto's standing was never specifically raised as an issue to be decided in the pretrial order. Thus, neither Ajinomoto nor the court was sufficiently put on notice that standing was a contested issue. This delay effectively prevented Ajinomoto from offering into evidence the pertinent provisions of Soviet law or the purported assignment to Ajinomoto by the inventors that is recorded in the PTO.

4. Nevertheless, the chain of title evidenced by the record is sufficient to confer standing on Ajinomoto. It is undisputed that the invention was made by the inventors in the course of their employment at Genetika, a Soviet institution. (P 8) n31 Therefore, even though the Inventors' Certificate n32 was issued in the names of the inventors, according to Soviet law, the invention became the property of the Soviet government. (D.I. 196, Ex. 5 at PP 24, 26; n33 see also Baev, supra, at 366-69; Pisarenko & Goldstein, supra, at 171-72; Pitta, supra, at 325-26) Soviet law also dictated that "patenting (legal protection) of the Soviet inventions abroad [and] selling of licenses for the Soviet inventions" was to be controlled by the Soviet government through the appointed enterprise, [*99] organization, or institution. (D.I. 196, Ex. 5 at PP 103, 105-06; see also Baev, supra, at 366-69; Pisarenko & Goldstein, supra, at 171-72; Pitta, supra, at 325-26) Given the absence of exclusive property rights and private ownership of property in the former Soviet Union at the time the *'765* patent issued, it can hardly be questioned that the *'765* patent was the property of the Soviet government despite the fact that the patent was issued in the name of the inventors. See, e.g., *United States v. Pink, 315 U.S. 203, 86 L. Ed. 796, 62 S. Ct. 552 (1942)* (discussing the nationalization of the business, funds, and property of Russian insurance companies); *Tillman v. United States, 162 Ct. Cl. 612, 320 F.2d 396 (Ct. Cl. 1963)* (discussing nationalization of all banks in Russia); *Salimoff v. Standard Oil Co., 262 N.Y. 220, 186 N.E. 679 (N.Y. 1933)* (discussing nationalization of oil reserves in Russia) . Thus, evidence of an assignment from the named inventors to Genetika or its predecessors is not necessary. Consequently, the chain of title evidenced in the record is complete. (PP 84-88) Because Ajinomoto has demonstrated sufficiently that it is the assignee of [*100] the *'765* patent, it rightfully has standing to sue ADM for infringement of the *'765* patent. Accordingly, ADM's post-trial attempt to dismiss the action fails.

n31 **The indicated paragraphs refer to Part I, Findings of Fact.**

n32 Although Soviet law in 1978 provided for patent protection, the dominant means of protecting intellectual property rights of inventors was an Inventor's Certificate. See Andrew A Baev, Recent Changes in Russian Intellectual Property Law and Their Effect Upon the Protection of Intellectual Property Rights in Russia, *19 Suffolk Transnat'l L. Rev. 361, 366-69 (1996);* Anatiliy P. Pisarenko & Steven J. Goldstein, The Intellectual Property Laws of Ukraine, *78 J. Pat. & Trademark Off. Soc'y 149, 171-72 (1996);* Laura A. Pitta, Comment, Strengthening the Legal Basis of Perestroika: The U.S.S.R. Draft Laws on Inventive Property, 7 Santa Clara Computer & High Tech. L.J. 321, 325-26 (1991). In the case of employee inventions, only an Inventor's Certificate could be issued. (D.I. 196, Ex. 5 at P 24; see also Baev, supra, at 368)

n33 "The exclusive right of the State to an invention shall have a duration of 15 years from the filing date of the application."

[*101]

B. Infringement

5. Ajinomoto contends that ADM's importation of strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) into the United States infringes Ajinomoto's patent rights because ABP's process of making the strains literally infringes claims 1 and 2 of the *'765* patent. Ajinomoto's claim is based upon [HN3] *35 U.S.C. § 271*(g) which provides:

> Whoever without authority imports into the United States or offers to sell, sells, or uses within the United States a product which is made by a process patented in the United States shall be liable as an infringer, if the importation, offer to sell, sale, or use of the product occurs during the term of such process patent. . . . A product which is made by a patented process will, for purposes of this title, not be considered to be so made after—
> (1) it is materially changed by subsequent processes; or
> (2) it becomes a trivial and nonessential component of another product.

35 U.S.C. § 271(g). Under 271(g) it is Ajinomoto's burden to demonstrate, inter alia, that (1) ABP's strains were produced according to the *'765* process; and (2) ADM imported the strains into the United States. n34 See Novo Nordisk of [*102] *North America, Inc. v. Genentech, Inc., 77 F.3d 1364, 1367-68;* cf. *Eli Lilly & Co. v. American Cyanamid Co., 896 F. Supp. 851, 855-56 (S.D. Ind. 1995)* (also requiring the patentee to demonstrate, if the products were produced pursuant to the patent process, that they were not materially changed by subsequent processes).

> n34 The court already has found that "ADM clearly has imported, sold and/or used the products at issue in the United States without authority." (D.I. 272 at 25 n.13)

6. The Federal Circuit has set forth [HN4] a two-step analysis for determining whether a patent claim is infringed:

> "First, the claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process."

Novo Nordisk of North America, Inc., 77 F.3d at 1368 (quoting *Carroll Touch, Inc. v. Electro Mechanical Sys., 15 F.3d 1573, 1576 (Fed. Cir. 1993).*

1. Claim Construction

7. [HN5] It is the court's "power and obligation to [*103] construe as a matter of law the meaning of language used in the patent claim." *Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995),* aff'd, *517 U.S. 370, 116 S. Ct. 1384, 134 L. Ed. 2d 577 (1996).* Courts are directed to consider three sources to ascertain the meaning of a claim: The literal language of the claim, the patent specification, and the prosecution history. When interpreting the words of the claim, the court should "ascribe [to the words] their ordinary meaning unless it appears the inventor used them otherwise." *Bell Communications Research, Inc. v. Vitalink Communications Corp., 55 F.3d 615, 620 (Fed. Cir. 1995).* The words of the claim must be construed in the light of the specification, whose "description may act as a sort of dictionary, which explains the invention and may define terms used in the claims." *Markman, 52 F.3d at 979.* The court should also consider the patent's prosecution history, as it constitutes an "undisputed public . . ." expression of what the patentee understood in terms of claim construction. *Id. at 980.* [HN6] The court may, in its discretion, consider extrinsic evidence "to assist in its construction of the written [*104] document, a task it is required to perform." *Id. at 981.* "Extrinsic evidence consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Id. at 980.* Neither the patent's prosecution history nor any extrinsic evidence considered can "enlarge, diminish, or vary" the limitations in the claims. Id.

8. **"Genes controlling the synthesis of a selected aminoacid."** The parties dispute the meaning of the phrase "genes controlling the synthesis of a selected aminoacid" which appears in claim 1 of the *'765* patent. Claim 1 requires the chromosome DNA fragment of the donor bacterium that is to be used to form the hybrid plasmid to contain "genes controlling the synthesis of a selected aminoacid." ADM argues that the phrase should be construed to mean **all** genes controlling the synthesis of a selected amino acid, and that ABP's strains do not literally infringe claim 1 because ABP's plasmids do not carry the asd gene. According to ADM's construction, the threonine operon would not satisfy the claims and, thus, the threonine producing E. coli described in the specification do [*105] not fall within the scope of claim 1. Ajinomoto takes the position that the phrase "genes controlling the synthesis of a selected aminoacid" and the term "operon" are equivalent.

9. ADM supports its position that the phrase "genes

controlling the synthesis of a selected aminoacid" should be construed to include all genes controlling the synthesis of a selected amino acid by reference to the *'765* patent specification, the claims, and expert testimony. The *'765* patent specification states:

> For further work in constructing the strain producing an aminoacid use is made of hybrid plasmids containing **all** the selected genes controlling the synthesis of the given aminoacid. In this case, if the isolated plasmids do not contain **all the required genes**, the above-mentioned operations are repeated by modifying the fragmentation of DNA, e.g., by using another specific endonuclease.

(JX 1 at col.5, lines 21–28) (emphasis added). Claim 1 of the *'765* patent uses the phrase "genes controlling the synthesis of a selected aminoacid," (JX 1 at col. 12, line 5), whereas claims 3 and 4 refer to the threonine operon, (JX 1 at col. 12, lines 28–29, 45–46). ADM points out that operons [*106] do not invariably contain all the genes controlling the synthesis of an amino acid, and not all species have genes controlling the synthesis of any particular amino acid which are organized as an operon. (P 59)

10. Ajinomoto seeks to interpret the phrase as meaning the operon. The term "operon" is defined in the *'765* patent as "a jointly controlled group of genes generally monitoring the synthesis of a single product, e.g. aminoacid." (JX 1 at col. 1, lines 49–51) In supporting its position, Ajinomoto argues that the threonine operon is encompassed in the phrase "genes controlling the synthesis of a selected aminoacid" because the operon controls the synthesis of threonine. In the examples set forth in the *'765* patent and ABP's construct, once a plasmid that contained the threonine operon was inserted into an auxotrophic host, the strain was able to produce threonine. Dr. Falkinham testified that "in using the word operon, we would also include those genes involved in the regulation of expression of the — those — genes for threonine synthesis." (D.I. 308 at 322) On cross examination, Dr. Rudolph agreed that "in the ordinary course of business that we call the science of microbiology, [*107] when one refers to the genes controlling the synthesis of the selected amino acid, they refer to in the fashion you have with regard to Tribe . . . the structural genes that are involved in the expression of that aminoacid." (D.I. 317 at 1649)

11. Neither Ajinomoto nor ADM introduced specific evidence regarding the use of the term "operon" and the phrase "genes controlling the synthesis of a selected aminoacid" by one skilled in the art at the time of the invention.

12. Based on this evidence and the specification, the court concludes that the phrase "genes controlling the synthesis of a selected aminoacid" refers to the amino acid operon.

2. Comparison of the Claims to the Accused Strains

13. Claim 1 of the *'765* patent describes a method whereby a chromosome DNA fragment of a donor bacterial strain containing the genes for the production of the selected amino acid which has a mutation destroying the negative regulation of the amino acid is combined with an amplifiable plasmid DNA molecule to form a hybrid DNA molecule, followed by transformation into a recipient bacterial strain having a mutation blocking the synthesis of the amino acid and a mutation partly blocking a related [*108] step of the metabolism of the amino acid. (P 30) Based on the findings of fact and the court's claim construction, ABP's process of constructing strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) falls within the literal scope of claim 1 of the *'765* patent. All of these strains were constructed by combining a chromosome DNA fragment having the required characteristics, n35 said fragment originally obtained from MG422, with an amplifiable plasmid pBR322 or a portion thereof, to form a hybrid plasmid which was then used to transform a host strain (G472T23) that was auxotrophic for threonine and was partially blocked in threonine metabolism by a mutation in the ilvA gene. (PP 91–96, 116–117) Although the construction of plasmids pYNSTOP and pYNTE2 require additional steps (PP 116–117), infringement is not avoided given the open claim language of claim 1. The resultant bacterial strains all possessed increased productivity of threonine as required by claim 1. (PP 95, 116–117)

> n35 Although at trial ADM continued to argue that the term "chromosome DNA fragment of a donor bacterium" should not be interpreted to include DNA fragments from plasmids or bacteriophages, the court is not persuaded that a change in its prior interpretation (D.I. 289 at P 1) is warranted.

[*109]

14. Claim 2 sets forth a method as claimed in claim 1 whereby prior to transformation, ballast genetic material n36 is removed from the hybrid plasmid. (P 31) Based on the findings of fact, the court concludes that the plasmids at issue were constructed using the method set forth in claim 2. In constructing pYN8, ABP subjected plasmid pYN7 to restriction digestion and removed and discarded an incomplete copy of pBR322, replacing it with a complete version of the plasmid and spacer DNA

from plasmid pSGS18. (PP 91, 94) Although the resultant plasmid, pYN8, is larger than pYN7, claim 2 does not require that the resulting hybrid plasmid be reduced in size. (PP 29, 31, 94) Moreover, if the incomplete copy of pBR322 had not been removed, the resultant plasmid would have contained two copies of pBR322. Thus, prior to transformation, ABP removed from pYN7 ballast genetic material. Since pYNSTOP is the product of an additional step in the construction of pYN8, its construction also used the method set forth in claim 2. (P 116) Finally, in constructing pYNTE2, unwanted genetic material from plasmid pKYN8 was removed and subsequently replaced with a portion of plasmid pBR322. (P 117) Thus, the [*110] construction of all three strains involved the removal of ballast genetic material from the hybrid plasmid prior to transformation.

n36 Ballast genetic material being unwanted, unneeded DNA. (P 31)

15. ADM asserts that, even if strain G472T23(pYN8) was constructed using a process covered by claims 1 and 2 of the *'765* patent, strains G472T23(pYNSTOP) and G472T23(pYNTE2) are materially changed from G472T23(pYN8) and thus their importation into the United States would not be an act of infringement under *35 U.S.C. § 271*(g). The issue of material change arises only when "[a] product which is made by a patented process . . . is materially changed by subsequent processes." *35 U.S.C. § 271*(g) (emphasis added); *Eli Lilly & Co. v. American Cyanamid Co., 82 F.3d 1568, 1577 (Fed. Cir. 1996)* ("A product will be considered to have been made by a patented process if the additional processing steps which are **not covered by the patent** do not change the physical or chemical properties of the product in a manner which [*111] changes the basic utility of the product [produced] by the patented process.") (emphasis added) (quoting S. Rep. No. 83, 100th Cong., 1st Sess. 50 (1987)). [HN7] In order for a product to be considered materially changed, there must be "a real difference between the product imported, offered for sale, sold, or used in the United States and the products produced by the patented process." *Bio-Technology General Corp. v. Genentech, Inc., 80 F.3d 1553, 1560 (Fed. Cir. 1996)*. Modification of the product of a patented process does not constitute material change if the process claim encompasses both the unmodified and modified product forms. See id.

16. ADM's argument is based on the assumption that strain G472T23(pYN8) is the only strain which is made by the *'765* patent claimed process. However, the court has already determined that strains G472T23(pYNSTOP) and G472T23(pYNTE2) were also constructed using the method set forth in claims 1 and 2 of the *'765* patent. There is no evidence indicating that, following their construction, strains G472T23(pYNSTOP) and G472T23(pYNTE2) were modified by any subsequent processes prior to importation. Therefore, ADM "cannot maintain that the 'materially [*112] changed' exception to infringement applies, because the product[s; i.e., strains G472T23(pYNSTOP) and G472T23(pYNTE2),] made by the patented process [are] not changed at all, let alone 'materially changed.'" Id. Accordingly, the court concludes that strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) infringe claims 1 and 2 of the *'765* patent.

C. Validity

17. "[HN8] A patent is presumed valid, and the burden of proving invalidity, whether under § 112 or otherwise, rests with the challenger. Invalidity must be proven by facts supported by clear and convincing evidence." *United States v. Telectronics, Inc., 857 F.2d 778, 785 (Fed. Cir. 1988)*. The issues of enablement and obviousness are questions of law; however, a determination of enablement or obviousness is based on factual inquiries. See, e.g., *In re Goodman, 11 F.3d 1046, 1049-50 (Fed. Cir. 1993); B.F. Goodrich Co. v. Aircraft Braking Systems Corp., 72 F.3d 1577, 1582 (Fed. Cir. 1996)*.

1. *35 U.S.C. § 103* — Obviousness

18. ADM contends that claims 1 and 2 of the *'765* patent are invalid for obviousness under *35 U.S.C. § 103*. Specifically, ADM argues that (1) the combined teachings of Tribe [*113] and Kozlov readily suggest the method set forth in claim 1; (2) the teachings of Kozlov with respect to transformation and selection in combination with the Genetika articles, which disclose the donor and recipient strains, render claim 1 obvious; and (3) the removal of ballast genetic material as required by claim 2 is taught by Clarke/Carbon and one skilled in the art would be motivated to apply these teachings to the Tribe, Kozlov, and Genetika teachings.

19. [HN9] A patent is invalid under *35 U.S.C. § 103*

> if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

[HN10] Obviousness under § 103 is a legal conclusion based on several factual inquiries: "(1) the scope and content of the prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the

pertinent art; and (4) secondary considerations, if any, of nonobviousness." *Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1050 (Fed. Cir. 1988)*, aff'd in part vacated [*114] in part, *939 F.2d 1540 (Fed. Cir. 1991)*. Secondary considerations include "evidence of factors tending to show nonobviousness, such as commercial success of the invention, satisfying a long-felt need, failure of others to find a solution to the problem at hand, and copying of the invention by others." *B.F. Goodrich Co., 72 F.3d at 1582*. "The burden of showing, by clear and convincing evidence, the invalidity of [patent claims] is especially difficult when the prior art was before the PTO examiner during the prosecution of the application." *Hewlett-Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1467 (Fed. Cir. 1990)* However, where there is "no PTO view . . . on obviousness in view of [the asserted] references[,] the burden of proof . . . is more easily carried." *EWP Corp. v. Reliance Universal Inc., 755 F.2d 898, 905 (Fed. Cir. 1985)*. Nevertheless, the burden of proof on invalidity remains with the party challenging the patent. See *Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1375 (Fed. Cir. 1986); American Hoist & Derrick Co. v. Sowa & Sons, Inc., 725 F.2d 1350, 1358 (Fed. Cir. 1984)*.

20. It is undisputed that none of the prior art [*115] publications standing alone renders the teachings of the *'765* patent obvious. Nevertheless, ADM argues that when viewed together, all of the elements of claims 1 and 2 are found. [HN11] When obviousness is based on prior art references, "there must be a showing of a suggestion or motivation to modify the teachings" of those references. *B.F. Goodrich Co., 72 F.3d at 1582*. This suggestion to modify the art need not be expressly stated in the references, "'rather the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.'" *Cable Elec. Prods., Inc. v. Genmark, Inc., 770 F.2d 1015, 1025 (Fed. Dir. 1985)* (quoting *In re Keller, 642 F.2d 413, 425 (C.C.P.A. 1981))*. Hindsight reconstruction and/or "the blueprint drawn by the inventor," *Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1138 (Fed. Cir. 1985)*, may not be used "to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention," *In re Fine, 837 F.2d 1071, 1075 (Fed. Cir. 1988)*. "The question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" [*116] *In re Beattie, 974 F.2d 1309, 1311* (Fed. Cir. 1992 (quoting *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462 (Fed. Cir. 1984))*. Accord *In re Fine, 837 F.2d at 1074-75; ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577 (Fed. Cir. 1984)*.

21. **Scope and Content of the Prior Art.** A threshold question is whether any or all of the publications identified by ADM should be characterized as "prior art." [HN12] Prior art has been defined as "knowledge that is available, including what would be obvious from it, at a given time, to a person of ordinary skill in an art." *Kimberly-Clark Corp. v. Johnson & Johnson, 745 F.2d 1437, 1453 (Fed. Cir. 1984)*. The claims of the *'765* patent are directed to a method for the construction of genetically engineered bacterial strains possessing an enhanced capacity of producing selected amino acids without the need for additional growth factors. All of the references identified by ADM are within the field of microbial genetics, "the field of the inventor[s'] endeavor." *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc., 796 F.2d 443, 449 (Fed. Cir. 1986)*. It is undisputed that the Kozlov [*117] article and the Clarke/Carbon article are prior art, and the court has already concluded (D.I. 272 at 45) that the Genetika articles are prior art. Thus, the only remaining issue is whether the Tribe thesis was "'sufficiently available to the public interested in the art,'" *In re Cronyn, 890 F.2d 1158, 1160 (Fed. Cir. 1989)* (quoting *Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1568 (Fed. Cir. 1988))*, "more than one year prior to the [priority] date," *35 U.S.C. 102*(b). It is ADM's burden to prove by clear and convincing evidence that the Tribe thesis was in fact prior art to the *'765* patent. See *RCA Corp. v. Data General Corp., 701 F. Supp. 456, 468 (D. Del. 1988)*, aff'd, *887 F.2d 1056 (Fed. Cir. 1989); Mannesmann Demag Corp. v. Engineered Metal Prods. Co., Inc., 605 F. Supp. 1362, 1367 (D. Del. 1985)*, aff'd, *793 F.2d 1279 (Fed. Cir. 1986)*.

22. [HN13] The test for determining whether a prior art reference was publicly available is whether

> 'it has been disseminated or otherwise made available to the extent that persons interested and of ordinary skill in the subject matter or art[] exercising reasonable diligence can locate it . . . .'

[*118] *Massachusetts Institute of Technology v. AB Fortia, 774 F.2d 1104, 1109 (Fed. Cir. 1985)* (quoting *In re Wyer, 655 F.2d 221, 226 (C.C.P.A. 1981))*. Although the determination of "public accessibility" is to made on a case-by-case basis, see *In re Hall, 781 F.2d 897, 899 (Fed. Cir. 1986)*, certain guidelines have emerged. The requirement may be met by distributing or making the paper available at a conference where members of the interested public were "told of the paper's existence and informed of its contents." See *Massachusetts Institute of Technology, 774 F.2d at 1109*. Cataloging and shelving of a doctoral thesis in a university library that is readily accessible to

those interested in the art also satisfies the standard. See *In re Hall, 781 F.2d at 899* (finding a doctoral thesis catalogued in a university library, easily accessible to the interested public, a "printed publication"). However, limited distribution, even to those skilled in the art, does not amount to public accessibility. Thus, distribution of a master's thesis to three members of a faculty committee responsible for assessing the student's entitlement to a degree, accompanied by "depositing the thesis [*119] in the university library where it remained uncatalogued and unshelved as of the critical date," did not satisfy the standard. *In re Bayer, 568 F.2d 1357, 1362 (C.C.P.A. 1978).* Likewise, titles of theses listed on cards filed alphabetically by author in a shoebox in the chemistry department were not catalogued or indexed in a sufficiently "meaningful way" to make them reasonably accessible to the public. *In re Cronyn, 890 F.2d at 1161.* It is irrelevant to the public accessibility determination whether "members of the public actually received the information." *Constant, 848 F.2d at 1569.*

23. The key to determining whether the Tribe thesis was publicly available is whether the thesis was indexed, cataloged, and shelved on the critical date. See *In re Cronyn, 890 F.2d at 1161.* In the absence of evidence establishing a specific date of cataloging and shelving, "**competent evidence** of general library practice may be relied upon to establish an approximate time when a thesis became accessible." *In re Hall, 781 F.2d at 899* (emphasis added). In the present case, ADM relied entirely on the testimony of Dr. Tribe to prove that the thesis was prior art. n37 However, [*120] Dr. Tribe had no actual first-hand knowledge of the procedures employed by the university libraries, being a doctoral candidate not a member of the library personnel. (P 33) Moreover, he was not present at the university for most of the 1977 to 1978 period; consequently, he admitted there were "many details of the cataloging with which [he] would not be familiar." (P 36) Thus, his testimony is speculative and not probative of general indexing, cataloging, and shelving procedures at the University of Melbourne libraries at issue. Cf. *In re Hall, 781 F.2d at 899* (relying on the affidavit of the director and manager of the Loan Department of the Library of Freiburg University with respect to general library procedures in estimating the time it would have taken to make the dissertation available to the interested public). Although a single cataloged copy of a thesis in a foreign university library is sufficient under *35 U.S.C. § 102*(b), see *id. at 900,* ADM has not established by clear and convincing evidence that the Tribe thesis was in fact catalogued and shelved by the critical date in question.

n37 Although ADM submitted a date-stamped copy of the Tribe thesis into evidence, the significance of the date stamped was based entirely on the testimony of Dr. Tribe.

[*121]

24. ADM also asserts that Dr. Tribe's three presentations of his doctoral research in the United States prior to June 30, 1978, as well as the submission of his thesis to Dr. Demane at M.I.T. in 1977, made Tribe's work public knowledge in the United States as prior art under *35 U.S.C. § 102*(a), and corroborate the public availability of the Tribe thesis under § 102(b). However, the case defendant cites in support of its assertion, *Massachusetts Institute of Technology v. AB Fortia, 774 F.2d 1104 (Fed. Cir. 1985),* is inapposite. In Massachusetts Institute of Technology, the court found that a paper delivered at a conference attended by between 50 and 500 persons interested and skilled in the art, copies of which were distributed without restriction to at least six persons, constituted a "printed publication" under *35 U.S.C. § 102.* See *id. at 1109.* In the present case, however, there is no indication that Dr. Tribe distributed copies of his thesis at the presentations. The record is also devoid of any evidence delineating the content of Dr. Tribe's presentations except for vague generalizations. n38 (P 37) Because it is not clear whether the relevant information contained [*122] in the Tribe thesis was disseminated during the presentations, the court cannot conclude that the "invention was known" as required under § 102(a). Moreover, the limited distribution of the thesis to Dr. Demane, a member of the committee responsible for assessing Dr. Tribe's work, does not amount to public knowledge and/or availability. See *In re Bayer, 568 F.2d at 1362.* Accordingly, the court concludes ADM has not established by clear and convincing evidence that the Tribe thesis is prior art to the *'765* patent.

n38 The same is true with respect to the non-U.S. presentations of his research. (P 38)

25. **The Differences Between the Claims and the Prior Art.** Once the prior art is identified, the focus of the analysis centers on the differences between the claimed invention and the prior art. See *Gardner v. TEC Systems, Inc., 725 F.2d 1338, 1345 (Fed. Cir. 1984); Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 717 (Fed. Cir. 1991)* ("When analyzing a patent claim for obviousness, the claim should be considered [*123] as a whole, but the [principal] differences between the [patented] claim and the prior art need to be identified."). The analysis centers on the ultimate legal question, "whether these differences are such that the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made." *TEC Systems, Inc., 725 F.2d at 1345.*

26. Since the court has determined that the Tribe thesis does not constitute prior art, the question in the case at bar is whether the teachings of the Kozlov article when considered with the teachings of the Genetika references and the Clarke/Carbon article show each and every element required by claims 1 and 2 and suggest the reasonableness of their combination. Based on the findings of facts, the court concludes that the Genetika references in combination with the Kozlov article do not render claim 1 obvious. (PP 46–47, 49–50) The Kozlov reference teaches a method for isolating and amplifying specific chromosomal markers. (P 46) It does not teach: (1) the use of a chromosomal DNA fragment having the required characteristics; and (2) a recipient strain having a mutation blocking the related step of metabolism [*124] of the selected amino acid. P 47) These deficiencies are not cured by the Genetika references, which merely describe the donor and recipient strains used in the examples disclosed in the specification of the *'765* patent. (P 49) Likewise, the isolated statement in the last paragraph of the Clarke/Carbon article, which suggests that hybrid plasmids can be made smaller by endonuclease digestion (P 53), does not provide the guidance necessary to render the ballast removal step of claim 2 obvious. Moreover, there is no evidence indicating that one skilled in the art would be motivated to combine these references to achieve the claimed invention. The fact that the references all deal with E. coli containing hybrid plasmids does not sufficiently "'suggest the desirability, and thus the obviousness, of making the combination'" as required. *In re Beattie, 974 F.2d at 1311* (quoting *Lindemann Maschinenfabrik, 730 F.2d at 1462).*

27. Even if the Tribe thesis were considered prior art, the *'765* patent still would not be rendered obvious to one of skill in the art at the time of the invention. ADM asserts that the motivation to combine the Tribe thesis and the Kozlov reference lies in [*125] the Tribe thesis itself, which suggests the use of high copy number or relaxed plasmids to amplify the amino acid genes. (P 39) However, isolated statements in a 193 page dissertation that discusses a technique employing a stringent plasmid does not constitute proof of motivation to combine. See *In re Fine, 837 F.2d at 1075; Interconnect Planning Corp., 774 F.2d at 1138.* This is particularly true where the focus of the two references differs (PP 39, 46) and one reference in several instances teaches away from the claimed invention (PP 39–43). See *In re Gurley, 27 F.3d 551, 553 (Fed. Cir. 1994); In re Bell, 991 F.2d 781 at 785; Bausch & Lomb, Inc., 796 F.2d at 448.* Such reliance on selected statements in the prior art to suggest the combination of the asserted references constitutes nothing more than hindsight reconstruction and, as such, cannot establish obviousness.

28. Even assuming arguendo that motivation to combine the references existed, the Tribe thesis in combination with the Kozlov article does not teach the process set forth in claim 1 of the *'765* patent. The deficiencies in the Kozlov article (P 47) are not cured by the Tribe thesis. In particular, the combined [*126] disclosures of Tribe and Kozlov do not teach the recipient strain called for by claim 1. (P 43, 47) Thus, the teachings of Tribe and Kozlov do not provide the motivation and guidance to combine their teachings so as to render claim 1 obvious.

29. **The Level of Ordinary Skill in the Pertinent Art.** [HN14] There are six factors a court should consider in determining the level of ordinary skill in the art: (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) the prior art solutions; (4) the rapidity of innovation; (5) the sophistication of the technology at issue; and (6) the educational level of active workers in the field. See *Bausch & Lomb, Inc., 796 F.2d at 449–50.* In accordance with the court's prior determination, for purposes of this action,

> the person of ordinary skill in the art as of June 30, 1978 would have had a Ph.D. in microbial genetics, with at least three years or more of post–doctoral experience. This person would have had experience in biochemistry and molecular genetics, and would have been aware of microbial recombinant DNA technology in vivo and in vitro.

(D.I. 274 at 43 n.17)

30. **Secondary** [*127] **Considerations.** [HN15] Objective indicia of nonobviousness must be considered before a conclusion on obviousness can be made. See *Hybritech, 802 F.2d at 1380; Cable Elec. Prods., Inc., 770 F.2d at 1026* (Secondary considerations must be considered "always, 'not just when the decisionmaker remains in doubt after reviewing the art.'" (quoting *Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 1539 (Fed. Cir. 1983)).* In the instant action, the secondary considerations provide support for a finding that ADM has failed to carry its burden. For a number of years, ADM sought the best threonine–producing bacterial strain. (PP 97–111) Although ADM contends that it was content to go forward with commercial production using the Kodak strain, the record indicates that between January 1990 and May 1992 ADM repeatedly attempted to obtain the *'765* patent technology, which Dr. Stauffer had praised, from Genetika. (PP 98, 103–105, 107) Only after ADM realized it could not obtain the Genetika technology did it agree to purchase ABP's threonine technology, which ADM knew to be derived from the Genetika microorganism. (PP 110–111) Thus, despite the fact that the strains specifically identified [*128] in the *'765* patent had never been used commer-

cially, ADM continued to seek the Genetika technology. (PP 103–105, 107, 110–111) "ADM's quest to purchase the *'765* technology in light of the failure of alternative threonine–producing technologies," (D.I. 274 at 46 n.21), is indicative of the nonobviousness of the claimed invention.

31. In light of the test set out in Graham, the court concludes, after examining the prior art and secondary considerations of nonobviousness, that ADM has failed to prove by clear and convincing evidence that the *'765* patent is invalid on obviousness grounds. The claimed invention is several steps removed from the information presented by the prior art references.

2. *35 U.S.C. § 112* — Best Mode and Enablement.

32. ADM also contends that the *'765* patent is invalid under *35 U.S.C. § 112*. Specifically, ADM argues that: (1) the *'765* patent does not disclose the best mode; (2) the *'765* patent fails to enable the full scope of generic claims 1 and 2; and (3) the inventors failed to deposit the requisite strains in a manner that made them freely available to the public as required by the PTO. The court will address ADM's arguments in seriatim [*129] .

33. **Best Mode.** ADM argues that the inventors knowingly failed to disclose the best mode of practicing the *'765* claimed invention because they did not explicitly set forth in the specification that, in order to achieve increased threonine production, the recipient strain was required to carry the relA<+> gene. [HN16] Section 112 provides in relevant part that "the specification . . . shall set forth the best mode contemplated by the inventor of carrying out his invention." *35 U.S.C. § 112*. The Federal Circuit has described [HN17] the best mode requirement as having two components:

> The first is a subjective one, asking whether, at the time the inventor filed his patent application, he contemplated a best mode of practicing his invention. If he did, the second inquiry is whether his disclosure is adequate to enable one skilled in the art to practice the best mode or, in other words, whether the best mode has been concealed from the public. . . . Our case law has interpreted the best mode requirement to mean that there must be no concealment of a mode known by the inventor to be better than that which is disclosed.

Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd., 927 [*130] *F.2d 1200, 1209–10 (Fed. Cir. 1991).* "Specific intent to deceive is not a required element of the best mode defense." *Graco, Inc. v. Binks Mfg. Co., 60 F.3d 785, 789–90 (Fed. Cir. 1995).* Any concealment of the best mode, whether accidental or intentional, is a violation of the best mode requirement. See *Dana Corp. v. IPC Ltd. Partnership, 860 F.2d 415, 418 (Fed. Cir. 1988); Spectra–Physics, Inc. v. Coherent, Inc., 827 F.2d 1524, 1535 (Fed. Cir. 1987); In re Sherwood, 613 F.2d 809, 816 (C.C.P.A. 1980).* Cf. *Brooktree Corp. v. Advanced Micro Devices, Inc., 977 F.2d 1555, 1575 (Fed. Cir. 1992)* ("Invalidity for violation of the best mode requires intentional concealment of a better mode than was disclosed.") (citation omitted).

34. The court has already recognized that "the best mode of practicing the *'765* invention requires that the bacterial host be characterized by the presence of the relA<+> gene." (D.I. 274 at 42) It is undisputed that at the time the *'765* patent application was filed, the inventors knew that the operons controlling threonine and isoleucine synthesis were positively regulated by the product of the relA<+> gene. (P 76) Thus, the only remaining [*131] question is whether one skilled in the art at the time of the invention would recognize the importance of the relA<+> gene from the specification. It is ADM's burden to prove by clear and convincing evidence that the *'765* patent is invalid for failure to disclose the best mode of practicing the invention. See *Engel Indus., Inc. v. Lockformer Co., 946 F.2d 1528, 1531 (Fed. Cir. 1991).*

35. According to the Federal Circuit,

> [HN18]
> one must consider the level of skill in the relevant art in determining whether a specification discloses the best mode. . . . Whether a best mode disclosure is adequate, that is, whether the inventor concealed a better mode of practicing his invention than he disclosed, is a function of not only what the inventor knew but also how one skilled in the art would have understood his disclosure.

Chemcast Corp. v. ARCO Indus. Corp., 913 F.2d 923, 927 (Fed. Cir. 1990). In the case at bar, at the time of the invention it was known to one of ordinary skill in the art that under conditions of amino acid starvation the operons of certain amino acids were positively regulated by the product of the relA<+> gene. (P 76) The parties' experts agree [*132] that one of skill in the art at the time of the invention, being familiar with the literature, would have been able to determine the best mode of practicing the *'765* claimed invention. (P 77)

36. The only mode for practicing the invention dis-

closed in the *'765* patent is the description in the specification of the preparation of strains VL334(pYN6) and VL334(pYN7). (P 79; JX 1) These strains were the only reductions to practice contemplated by the inventors at the time of the filing of the application. Although the specification does not expressly characterize the recipient strain VL334 as being relA<+>, it is undisputed that the parent strain of VL334, MG422, is relA<+>; thus, absent any indication of change to the relA gene, one skilled in the art would know that VL334 was also relA<+>. (P 79) Moreover, the literature in evidence indicates that the relA<+> gene is inherently present in incomplete isoleucine auxotrophs, such as VL334. (P 78) Thus, this is not an instance in which an inventor failed to disclose a non-claimed element that was necessary to practice the inventor's contemplated best mode. Rather, given the specification and the level of understanding [*133] in the art, a skilled practitioner would have readily recognized the allelic state of the relA gene in the disclosed strains and would have been able to practice the best mode of carrying out the claimed invention. Accordingly, the court concludes that ADM has failed to prove by clear and convincing evidence that the inventors failed to disclose the best mode of practicing the *'765* patent.

37. **Enablement — By Overbreadth.** ADM argues that the *'765* patent is invalid as not enabled pursuant to *35 U.S.C. § 112*. Specifically, ADM contends that the method of preparing bacterial strains set forth in the *'765* patent is unpredictable and unreliable, so that it would require undue experimentation for one skilled in the art to apply the teachings of the *'765* patent to strains other than E. coli or amino acids other than threonine.

38. [HN19] Section 112 mandates that a patent's specification

> contain a written description of the invention, and of the manner and process of making and using it, in such full, clear concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same . . . .

[*134]

35 U.S.C. § 112. This section requires that there be sufficient disclosure, either through illustrative examples or written description, to teach one skilled in the art how to make and use the invention as broadly as it is claimed. See *In re Vaeck, 947 F.2d 488, 496 (Fed. Cir. 1991)*. However, "it is not necessary that a patent applicant test all the embodiments of his invention; what is necessary is that he provide a disclosure sufficient to enable one skilled in the art to carry out the invention commensurate with the scope of his claims." *Amgen, Inc., 927 F.2d at 1213;* accord *In re Vaeck, 947 F.2d at 496* ("It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art."). A patent need not teach that which is well known in the art. See *Lindemann Maschinenfabrik GMBH, 730 F.2d at 1463*.

39. [HN20] The fact that some experimentation is necessary does not preclude enablement as long as the amount of experimentation is reasonable given the nature of the invention and the state of the art. See *In re Wands, 858 F.2d 731, 737-38 (Fed. Cir. 1988)*.

> The determination of what constitutes [*135] undue experimentation in a given case requires the application of a standard of reasonableness, having due regard for the nature of the invention and the state of the art. The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed. . . .
>
> [HN21] Factors to be considered in determining whether a disclosure would require undue experimentation . . . include (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

Id. at 737 (citations omitted). ADM has the burden of proving these facts by clear and convincing evidence. See *Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 941 (Fed. Cir. 1990)*.

40. Claims 1 and 2 of the *'765* patent are generic claims directed to a method for [*136] constructing bacterial strains possessing increased productivity of a selected amino acid. Given the number of different bacterial species known to exist at the time of the invention and the number of amino acids, in theory the process of claims 1 and 2 covers at least 1 million possible different combinations of bacterial species and amino acids. The specification of the *'765* patent provides a general

description of the method and three working examples. These three examples cover a single bacterial strain, E. coli, and a single amino acid, threonine.

41. Ajinomoto contends that the *'765* patent is a pioneering invention and as such it is entitled to claims of broad scope. A pioneer patent

> is commonly understood to denote a patent covering a function never before performed, a wholly novel device, or one of such novelty and importance as to mark a distinct step in the progress of the art, as distinguished from a mere improvement or perfection of what had gone before. Most conspicuous examples of such patents are the one to Howe, of the sewing machine; to Morse, of the electrical telegraph; and to Bell, of the telephone.

Boyden Power-Brake Co. v. Westinghouse, [*137] *170 U.S. 537, 561-62, 42 L. Ed. 1136, 18 S. Ct. 707 (1898);* accord *Schneider (USA) Inc. v. Cordis Corp., 1993 U.S. Dist. LEXIS 15483, 29 U.S.P.Q.2D (BNA) 1072, 1075 (D. Minn. 1993).* The Genetika researchers were not the first to use recombinant DNA technology. (P 8) However, whereas other researchers were applying recombinant DNA technology to the development of pharmaceuticals, the Genetika researchers were the first to apply this technology to the production of enzymes and amino acids. (P 8) Dr. Falkinham testified, without contradiction by Dr. Rudolph, that the *'765* patent was a pioneering patent because

> it took the recombinant DNA technology and now applied it to a technology[,] fermentation technology[,] in which the two fields have really never been brought together before.

(D.I. 316 at 1510). Given the novel nature of the claimed invention, the *'765* patent deserves pioneer patent status. When the court is confronted with a pioneer patent, "'liberality becomes the keynote of construction requiring the court to give the patentee a wide breadth of protection in construing the patent claims and specifications . . .'" *Ziegler v. Phillips Petroleum Co., 483* [*138] *F.2d 858, 870 (5th Cir. 1973)* (quoting *Corning Glass Works v. Anchor Hocking Glass Corp., 374 F.2d 473, 476 (3d Cir. 1967).*

42. Here, the inventors have set forth the manner by which bacterial strains having an increased productivity of a selected amino acid can be constructed. The level of skill in the art at the time when the application was filed was high. According to the record, all of the methods needed to practice the invention were well known to those skilled in the art. (PP 61-62, 66) Despite the diversity existing among bacteria, practitioners of this art were prepared to carry out the identification, isolation, recombination, and transformation steps required to practice the full scope of the claims. (PP 61-62, 66) The mere fact that in practice the method involved repetitive experimentation does not make it undue where such experimentation is routine. See *Johns Hopkins University v. CellPro, 931 F. Supp. 303, 322, 324 (D. Del. 1996).* Even though the record indicates that research efforts were ongoing regarding transformation techniques and the development of appropriate plasmids for some bacterial strains other than E. coli and for amino acids other than threonine, [*139] these limited examples are an insufficient basis on which to conclude that the methodology necessary for practicing the *'765* patent was not generally known and routine by 1978. Likewise, the fact that in the relatively few examples cited by ADM the genes controlling the synthesis of the selected amino acid were not contiguous is insufficient to render the claims nonenabled given the breadth of the combinations ostensibly covered by claim 1.

43. Reasonably interpreted, the evidence indicates that the amount of effort needed to practice the method set forth in the *'765* patent was not excessive. Given the disclosure in the specification of the *'765* patent and the level of skill in the art at the time of the invention, ADM has not proven by clear and convincing evidence that one skilled in the art at the time of the invention would not have been capable of following the inventor's instructions in order to realize the bacterial strains without undue experimentation. Accordingly, the court concludes that ADM has not carried its burden of demonstrating that the *'765* patent is not enabled by its disclosure.

44. **Enablement — By Deposit.** [HN22] The placement of microorganism samples in a public [*140] depository "has been considered adequate to satisfy the enablement requirement of *35 U.S.C. § 112,* when a written description alone would not place the invention in the hands of the public and physical possession of a unique biological material is required." *Amgen, Inc., 927 F.2d at 1210.*

> A deposit has been held necessary for enablement where the starting materials (i.e., the living cells used to practice the invention, or cells from which the required cells can be produced) are not readily available to the public. Even when starting materials

> are available, a deposit has been necessary where it would require undue experimentation to make the cells of the invention from the starting materials.

In re Wands, 858 F.2d at 735. For instance,

> [HN23] when biological sample required for the practice of an invention is obtained from nature, the invention may be incapable of being practiced without access to that organism. Hence the deposit is required in that case. On the other hand, when . . . the organism is created by insertion of genetic material into a cell obtained from generally available sources, then all that is required is a description of the best mode and [*141] an adequate description of the means of carrying out the invention, not deposit of the cells. If the cells can be prepared without undue experimentation from known materials, based on the description in the patent specification, a deposit is not required.

Amgen, Inc., 927 F.2d at 1211.

45. ADM asserts that the *'765* patent is not enabled unless the deposits required by the original PTO Examiner have been maintained and are readily accessible to the public. Prior to trial, the court concluded that "there remains a question as to whether a biological sample is required for the practice of this invention." ADM failed to offer any proof at trial on this issue, relying solely on the PTO's rejection of claims 1–4 of the *'765* patent application for failure to comply with M.P.E.P. 608.01(p) regarding deposit of the parent and newly developed E. coli strains. At no point did ADM address the PTO's subsequent finding that the *'765* patent was enabled without the required deposits. (P 68) Nor did ADM address its own expert's opinion that dependent claims 3 and 4 were enabled without deposits. (P 69)

46. ADM based its contention that the strains are not readily accessible to the [*142] public on Degussa's and Dr. Pardo's unsuccessful efforts to obtain the strains. These failed attempts are not sufficient to establish the unavailability of the strains. Although ADM refers to Degussa's and Dr. Pardo's efforts as "requests," these efforts are more accurately characterized as "inquiries" into the requirements for obtaining the strains from the depository. (PP 70–73) Moreover, these inquiries were inappropriately made since they failed to comply with the terms of the Budapest Treaty. (PP 70, 74) Furthermore, the Pardo inquiry does not on its face appear to seek any strain other than B3996. (P 72) Thus, the fact that Degussa and Dr. Pardo did not receive the "requested" strains is not indicative of the strains' purported unavailability. Accordingly, the court concludes that ADM has failed to establish by clear and convincing evidence that deposit of the strains was required to enable the claims and that the strain deposits are not publicly accessible.

3. *35 U.S.C. §§ 111,* 115 and 116 — Declaration Signatures.

47. ADM argues that the *'765* patent is invalid because not all of the inventors signed the declarations personally in violation of the statutory requirements [*143] in *35 U.S.C. §§ 111,* 115 and 116. [HN24] As part of a patent application, the inventor or inventors are required to sign the inventor's oath and declaration. Specifically, Section 115 of the Patent Act provides that "the applicant shall make oath that he believes himself to be the original and first inventor of the process . . . for which he solicits a patent . . . ." *35 U.S.C. § 115.* Section 116 provides that "when an invention is made by two or more persons jointly, they shall apply for a patent jointly and each make the required oath . . . ." *35 U.S.C. § 116.* Statutory exceptions to these requirements are found in *35 U.S.C. §§ 116*–118 and implemented at *37 C.F.R. §§ 1.42, 1.42,* and *1.47.* n39 These exceptions allow someone other than the inventor to sign the oath and declaration if the inventor is dead, insane or legally incapacitated, refuses to sign, or cannot be found or reached after diligent effort. None of these exceptions are applicable to the present case. Sections 116, 251 and 256 of the Patent Act contain remedial provisions that allow for an error to be corrected if it was made without any deceptive intent. n40

n39 [HN25] Section 116 of the Patent Act provides, in relevant part, the following:

> If a joint inventor refuses to join in an application for patent or cannot be found or reached after diligent effort, the application may be made by the other inventor on behalf of himself and the omitted inventor. . . . Whenever through error a person is named in an application for patent as the inventor, or through error an inventor is not named in an application, and such error arose without any deceptive intention on his part, the Commissioner may permit the application to be amended . . . .

35 U.S.C. § 116. Similar provisions exist in *37 C.F.R. § 1.47(a)* (inventor refuses to sign or cannot

be found). [HN26] Section 117 of the Patent Act provides:

> Legal representatives of deceased inventors and of those under legal incapacity may make application for patent upon compliance with the requirements and on the same terms and conditions applicable to the inventor.

35 U.S.C. § 117. Similar provisions exist in *37 C.F.R. §§ 1.42* (inventor dead) and 1.43 (inventor insane or legally incapacitated). [HN27] Section 118 of the Patent Act provides in part:

> Whenever an inventor refuses to execute an application for patent, or cannot be found or reached after diligent effort, a person to whom the inventor has assigned or agreed in writing to assign the invention or who otherwise shows sufficient proprietary interest in the matter . . . may make application for patent on behalf of and as agent for the inventor . . . .

35 U.S.C. § 118. Similar provisions exist in *37 C.F.R. § 1.47(b)* (inventor refuses to execute application or cannot be found).

[*144]

n40 [HN28] Section 251 provides in part:

> Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than he had a right to claim in the patent, the Commissioner shall . . . reissue the patent for the invention disclosed in the original patent, and in accordance with the new and amended application . . . .

35 U.S.C. § 251. [HN29] Section 256 provides in part:

> Whenever through error a person is named in an issued patent as the inventor, or through error an inventor is not named in an issued patent and such error arose without any deceptive intention on his part, the Commissioner may . . . issue a certificate correcting such error.
>
> The error of omitting inventors or naming persons who are not inventors shall not invalidate the patent in which such error occurred if it can be corrected as provided in this section.

35 U.S.C. § 256.

48. Despite the questionable authenticity of some of the signatures on the declarations, [*145] the court will not invalidate the *'765* patent unless fraud or inequitable conduct was practiced or attempted on the PTO in connection therewith. See *Aktiebolag v. Waukesha Cutting Tools, Inc., 640 F. Supp. 1139, 1140–41 (E.D. Wis. 1986); A.F. Stoddard & Co., Ltd. v. Dann, 184 U.S. App. D.C. 71, 564 F.2d 556, 562–67 (D.C. Cir. 1977); In re Bennett, 766 F.2d 524, 526–28 (Fed. Cir. 1985).* Without evidence of fraud or deceptive intent, the falsified n41 signatures are regarded as only technical errors and cannot be asserted as a basis for invalidating the patent. See *Aktiebolog, 640 F. Supp. at 1141.*

> n41 Although the word "false" often implies an intent to deceive, the court specifically disavows that meaning in the context of this decision.

49. In the case at bar, ADM alleges that the circumstances surrounding the false signatures establishes that the Russian inventors had a deceptive intention when they filed the declarations. Specifically, ADM argues that (1) there was no indication on the Supplemental [*146] English Declaration that the signatures were not genuine; and (2) by filing the falsely signed declarations, the inventors were able (a) to claim the Soviet priority date and (b) to overcome the § 112 rejection of the patent application. These circumstances alone are not sufficient to establish an intent to defraud the PTO on the part of the inventors. Although ADM claims, as further evidence of the inventors' deceptive intention, that Ajinomoto has made no effort to correct the defective patent, Ajinomoto has, in fact, filed a Supplemental Declaration with the PTO in order to rectify the signature discrepancies. (P 23) ADM has the burden to show, by clear and convincing evidence, that there was a deceptive intent in falsifying the inventors' signatures. ADM has failed to carry its burden. Consequently, the court shall not invalidate the *'765* patent based on the questionable authenticity of some of the signatures on declarations submitted to the PTO.

4. Inequitable Conduct.

50. ADM argues that the *'765* patent is unenforceable because the inventors failed to provide the PTO with the Genetika references; (2) misrepresented and failed to properly provide the PTO with the Kozlov [*147] reference; and (3) withheld the best mode of practicing the invention. n42 ADM contends the inventors' intent was to deceive the PTO. [HN30] The defense of inequitable conduct requires proof, by clear and convincing evidence, of the failure to disclose material information that was known or should have been known to the patentee or the submission of false material information to the PTO with the intent to mislead. See N.V. Akzo v. E.I. dupont *de Nemours, 810 F.2d 1148, 1153 (Fed. Cir. 1987).*

> n42 Because ADM failed to demonstrate that the inventors concealed the best mode of practicing the *'765* patent, this issue is moot.

51. The Federal Circuit has set forth [HN31] a two-step analysis for evaluating the defense of inequitable conduct:

> [First, t]he trial court must discern whether the withheld references satisfy a threshold level of materiality. The court must also determine whether the applicant's conduct satisfies a threshold showing of intent to mislead. . . . Next, assuming satisfaction of the thresholds, [*148] the trial court must balance materiality and intent. The more material the omission, the less culpable the intent required, and vice versa.

Halliburton Co. v. Schlumberger Techn. Corp., 925 F.2d 1435, 1439 (Fed. Cir. 1991) (footnote and citations omitted). The determination of inequitable conduct is within the discretion of the trial court. See *id. at 1439–40; Demaco Corp. v. F. Von Langsdorff Licensing Ltd., 851 F.2d 1387, 1395 (Fed. Cir. 1988)* ("The court is charged with reaching an equitable result in view of the particular circumstances of the case.").

52. **Materiality.** In this context, [HN32] facts or information is material if there is

> a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.

37 C.F.R. § 1.56 (1978). With respect to materiality, the only publications in dispute are the Genetika references. Although these articles do not teach or suggest the claimed invention, they do describe the donor and recipient strains used in the examples of the *'765* patent. (P 49) They also describe the relevance of the allelic state of the relA gene to the over [*149] synthesis of threonine. (P 49) Genetika II was listed in the reference section and cited to in the specification of the Russian priority patent. (P 10) There is nothing to suggest that a reasonable patent examiner would not consider the Genetika references important. However, given the fact that they do not teach or suggest the claimed invention, the degree of materiality is relatively low.

53. **Intent.** In addition to the materiality of the publications, to establish that the inventors acted inequitably, ADM must demonstrate that the inventors acted with an intent to deceive or mislead the PTO. See *Labounty Mfg., Inc. v. United States Int'l Trade Comm'n, 958 F.2d 1066, 1076 (Fed. Cir. 1992).* [HN33] Because direct evidence of intent is rarely available, intent may be inferred from clear and convincing evidence of the surrounding circumstances. See id.; *Kingsdown Medical Consultants, Ltd. v. Hollister Inc., 863 F.2d 867, 873 (Fed. Cir. 1988),* aff'd, *968 F.2d 1227 (Fed. Cir. 1992)* ("Whether the intent element of inequitable conduct is present cannot always be inferred from a pattern of conduct that may be described as gross negligence. That conduct must be sufficient to require [*150] a finding of deceitful intent in the light of all the circumstances."). However, the determination that an undisclosed reference is material does not presume an intent to deceive. See *Halliburton Co., 925 F.2d at 1442.* Furthermore, a showing that references with some degree of materiality were not disclosed is insufficient to establish inequitable conduct. See id.

54. In the instant action, it is undisputed that the inventors were aware of the Genetika references and the Kozlov article and did not provide copies of the articles to the PTO. (PP 45, 48) However, the circumstances do not establish by clear and convincing evidence an intent to defraud the PTO on the part of the inventors. Genetika II and the Kozlov article were among the sixteen references identified in the Russian patent application. (P 10) The pertinent contents of these references were identified by reference numbers throughout the text of the specification of the Russian patent application, a certified translation of which was included in the *'765* patent application. (P 10) Although reference to Genetika II was omitted from the *'765* patent application, the Kozlov article was cited in the specification of the [*151] U.S. patent application. (P 14) Thus, the Kozlov article clearly was disclosed to the PTO. See *37 C.F.R. § 1.97 (a)* (1978). With respect to Genetika II, its listing in the Russian priority document filed with the PTO does not support a conclusion of delib-

erate concealment despite the fact that it was not routine for PTO Examiners to examine the priority application. See *Demaco Corp., 851 F.2d at 1396.*

55. ADM also contends that the inventors misrepresented the teachings of the Kozlov article to the PTO, thereby leading the Examiner away from the importance of the reference as prior art. ADM's assertion that the Kozlov article teaches how to prepare amino acid producing bacterial strains through genetic engineering is not supported by the record. (P 46) The Kozlov article sets forth a procedure for isolating specific chromosomal markers whereby a hybrid plasmid containing some of the genes necessary for amino acid production is used to transform an auxotrophic host. (P 46) Thus, the specification of the *'765* patent correctly characterizes the importance of the Kozlov article. (JX 1 at col. 2, lines 37–44)

56. In light of the circumstances, the court concludes that the record [*152] does not support a finding of intent to deceive. Therefore, no balancing of materiality and intent is necessary. Accordingly, the court finds that ADM did not establish, by clear and convincing evidence, that the inventors engaged in inequitable conduct.

III. DAMAGES

1. Based on the foregoing, it is the court's conclusion that strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) infringe claims 1 and 2 of the *'765* patent. Accordingly, Ajinomoto is entitled to relief for ADM's infringement. Ajinomoto asserts that it is entitled to reasonable royalties, n43 enhanced damages, prejudgment interest, and injunctive relief.

> n43 The court already has concluded that Ajinomoto is not entitled to lost profit damages. (D.I. 276)

A. Reasonable Royalty

2. [HN34] The standard for damages for patent infringement is set forth in *35 U.S.C. § 284.* Section 284 provides that a patent owner whose patent has been infringed is entitled to "damages adequate to compensate for the infringement, but in no event less [*153] than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court." The reasonable royalty provision in the statute provides the "floor below which damage awards may not fall." *Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1544 (Fed. Cir. 1995).* The claimant bears the burden of proof on the issue of damages. See, e.g., *BIC Leisure Products, Inc. v. Windsurfing Int'l, Inc., 1 F.3d 1214, 1217 (Fed. Cir. 1993); Fromson v. Western Litho Plate & Supply Co., 853 F.2d 1568, 1574 (Fed. Cir. 1988),* aff'd, *909 F.2d 1495 (Fed. Cir. 1990).*

3. [HN35] A reasonable royalty is a measure of recovery "intended to provide a just recovery to persons who for evidentiary or other reasons cannot prove lost profits or an established royalty." *Hayhurst v. Rosen, 1992 U.S. Dist. LEXIS 7312, No. CV-91-4496, 1992 WL 123178,* at *13 (E.D.N.Y. May 18, 1992). It is defined as "a hypothetical royalty **for the use of the patented technology by the infringer,** calculated as if the parties negotiated at arm's length as a willing licensor and a willing licensee on the date when the infringement began." *Rite-Hite, 56 F.3d at 1576.* Although this hypothetical negotiation [*154] is characterized as a willing licensee–willing licensor negotiation, "the result has more of the character of a forced settlement where neither party gets all it would wish." Id. [HN36] Where, as here, the parties were previously not "willing," the court

> may consider additional factors to assist in the determination of adequate compensation for the infringement. These factors include royalties received by the patentee for the licensing of the patent in suit, opinion testimony of qualified experts, the patentee's relationship with the infringer, and other factors that might warrant higher damages.

Maxwell v. J. Baker, Inc., 86 F.3d 1098, 1109 (Fed. Cir. 1996) (citing *Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970)).* [HN37] The determination of a reasonable royalty is based upon the totality of the evidence, and the court is "**not** limited to selecting one or the other of the specific royalty figures urged by counsel as reasonable." *Smithkline Diagnostics Inc v. Helena Lab. Corp., 926 F.2d 1161, 1168 (Fed. Cir. 1991).*

4. For purposes of the hypothetical negotiation, the *'765* patent is deemed valid, enforceable, and [*155] infringed. See *TP Orthodontics Inc. v. Prof'l Positioners Inc., 1991 U.S. Dist. LEXIS 9660, 20 U.S.P.Q.2D (BNA) 1017, 1025 (E.D. Wis. 1991).* In addition, the parties are presumed to know all the facts relevant to the negotiation. See *Georgia-Pacific Corp., 318 F. Supp. at 1121.* [HN38] Although the hypothetical negotiation is presumed to take place on the eve of first infringement, the court is permitted to consider facts and events that occurred after infringement began even though those facts could not have been known by the hypothesized negotiators. See *Fromson, 853 F.2d at 1575.*

5. In the instant action, the hypothetical negotiations would have taken place in May 1993, just prior to ADM's first infringing sale. (D.I. 311 at 596; D.I. 315 at 1279) The parties each produced an expert who analyzed the relevant factors and provided an opinion as to the amount of a reasonable royalty. Dr. Bruce E. Stangle, testifying on behalf of Ajinomoto, opined that the reasonable royalty rate at the time of infringement would have been a flat royalty of at least $2.00/kg. n44 (D.I. 311 at 596) Dr. Strangle's opinion is based primarily upon the average profit/kilogram of threonine that Ajinomoto's [*156] partially-owned subsidiary, Eurolysine S.A, n45 experienced in 1993. (D.I. 311 at 600-01, 628-29) Dr. Julie L. Davis, testifying on behalf of ADM, opined that the rate would have been a running royalty rate of 3.25% of net sales. (D.I. 315 at 1304-05, 1353-56) Dr. Davis' opinion was primarily based upon the existing royalty rate negotiated between Ajinomoto and Eurolysine. (D.I. 315 at 1303-06, 1353-56)

n44 Dr. Jungi Nakamura, the head of development of Ajinomoto's Feed Additive Department, testified that Ajinomoto would have wanted a minimum royalty of $7.00/kg in any negotiation with ADM in 1993. (D.I. 310 at 503) According to Dr. Nakamura, a lower royalty rate would not have prevented ADM's entry in the market. (D.I. 310 at 504)

n45 Eurolysine, a French corporation, was formed in 1973 as a joint venture between Orsan, another French corporation, and Ajinomoto. (D.I. 276 at 2) Ajinomoto owns 20% of Orsan as well. (D.I. 276 at 2 n.2)

6. In attempting to calculate a reasonable royalty in this case, the [*157] court relies on the opinion testimony of the qualified experts and the record before it to establish what would have been known and considered by the parties at the hypothetical negotiation. The parties would have considered, inter alia, the following:

. Genetika licensed the *'765* patent technology to Ajinomoto in 1982 for a negotiated royalty rate of 3% of net sales. (PX 3; PP 84-88) This license was exclusive with respect to sales in Japan, the United States, France, the United Kingdom, and Italy. (PX 3; PP 85-86) In 1994 the license was amended, reducing the royalty rate to 2% of net sales. (D.I. 311 at 465; JX 5; PP)

. By May 1993, Ajinomoto had licensed its threonine technology only to Eurolysine. The negotiated royalty rate was 5.0% subject to various performance guarantees, with 3.25% being the minimum royalty. (D.I. 309 at 451-452; JX 3 at 5-6) In addition, Eurolysine made an up-front payment to Ajinomoto of $1.9 million. (JX 3 at 5) At the time of the negotiation, Ajinomoto owned 50% of Eurolysine. (D.I. 315 at 1282) Effective January 1, 1994, Ajinomoto became a 75% owner of Eurolysine (effectively 80% due to its 20% ownership of Orsan). (D.I. 308 at 348- [*158] 49; DX 728)

. Ajinomoto, which had a general policy of not licensing its competitors, would have been reluctant to license ADM, a strong competitor. (D.I. 311 at 623-24)

. ADM was a strong, low cost producer of agricultural products because it produced its own raw materials and energy. (D.I. 312 at 820-24) Therefore, its production costs with respect to threonine were reduced. (D.I. 315 at 1328)

. ADM anticipated entering the threonine market by 1991. (D.I. 315 at 1274-76; PP 100, 102) ADM had entered into an agreement with Kodak for the purchase and continued development of a bacterial strain capable of the commercial production of threonine. (D.I. 315 at 1274; P 99) ADM considered the Kodak strain a viable alternative to the ABP strains, but felt that by using the ABP strains it was "possible to reduce threonine cost from $1.32 per pound to $0.76 per pound," a savings of $1.23/kg in production costs. (PX 625) As a result, ADM was willing to pay up to $5 million for the ABP technology. (PX 625)

. ADM had a reputation for cutting prices in order to obtain a market share. (D.I. 309 at 411; D.I. 311 at 603-04, 613, 659; D.I. 315 at 1348-50) In fact, ADM sold the [*159] threonine it manufactured using the ABP strains at a loss throughout 1993 ($ 1.4 million), 1994 ($ 2 million), and 1995 ($ 7.5 million). (D.I. 311 at 658; JX 8) Although ADM's threonine sales netted a loss of approximately $13 million through fiscal year 1995, ADM's lysine sales yielded profits of over $112 million in 1993-95. (JX 8) ADM believed that threonine sales would

have a cross-marketing effect, increasing lysine sales by approximately 20%. (D.I. 311 at 659; D.I. 315 at 1320-21; PX 239; PX 439)

. In 1992 the average net selling price of threonine was 44 French francs ("FF"), and Eurolysine realized an average profit of $1.70/kg of threonine. (D.I. 311 at 650; D.I. 315 at 1280) In 1993 there was a rise in the price of threonine to 53 FF because production problems at Eurolysine caused a shortage of threonine and demand for threonine was increasing rapidly. (D.I. 311 at 599, 607, 617) In that year, Eurolysine's average profit was approximately $2.00/kg of threonine. (D.I. 315 at 1280) The price of threonine rose until early 1994. (D.I. 316 at 415) Thereafter, the price of threonine fell in response to ADM's price cutting. (D.I. 311 at 617-18)

. Eurolysine suffered [*160] a loss of $48-70 million in price erosion damages and $36 million in lost sales following ADM's entry into the threonine market. (D.I. 311 at 593, 619)

. ADM did not need strains or technological know-how or assistance as it already had ABP's strains. All ADM required was permission to use the *'765* patent. (D.I. 315 at 1291-92)

7. After careful consideration of the record before it, the court finds that if Ajinomoto and ADM had engaged in a hypothetical negotiation in May 1993 to determine the appropriate rate for a license of the *'765* patent, the parties would have settled on a fixed royalty rate of $1.23/kg of threonine. n46 Despite the fact that in its license agreements with Genetika and Eurolysine (both non-competitors), Ajinomoto agreed to pay and receive a percentage of sales price royalty, the court concludes that in the case at bar, a fixed per unit rate of royalty is appropriate. Given the competitive relationship between the parties, ADM's known willingness to entertain short term losses in order to gain market share, and ADM's apparent low production costs with respect to threonine, the court finds that Ajinomoto would have insisted upon a fixed rate royalty. [*161]

n46 This rate corresponds to the savings in production costs ADM predicted it would realize by purchasing the ABP technology. (PX 625) Although the "licensing rule of thumb" dictates that only one-quarter to one-third of the benefit should go to the owner of the technology (D.I. 315 at 1294-95), given ADM's relatively low production costs and its belief that the sale of threonine would increase the sale of lysine, the court concludes that ADM would have been willing to share all of the benefit with Ajinomoto and that Ajinomoto would have settled for nothing less.

B. Enhanced Damages — Willful Infringement

8. Ajinomoto contends that ADM willfully infringed the *'765* patent, warranting enhanced damages and attorneys' fees. [HN39] Pursuant to *35 U.S.C. § 284*, a court may in its discretion "increase the damages up to three times the amount found or assessed." The Federal Circuit has set forth a two-step analysis a court should employ in exercising its discretion:

> First, the fact-finder must determine whether [*162] an infringer is guilty of conduct upon which increased damages may be based. If so, the court then determines, exercising its sound discretion, whether, and to what extent, to increase the damages award given the totality of the circumstances.

Jurgens v. CBK, Ltd., 80 F.3d 1566, 1570 (Fed. Cir. 1996). A finding that an infringer acted willfully or in bad faith may entitle an aggrieved party to increased damages. Because an infringer's egregious conduct in infringement litigation is not related to the underlying act of infringement or the infringer's culpability, it is an insufficient basis on which to justify increased damages under § 284. See *id. at 1570-71*.

9. [HN40] The test for willful infringement is "'whether, under all the circumstances, a reasonable person would prudently conduct himself with any confidence that a court might hold the patent invalid or not infringed.'" *Hall v. Aqua Queen Mfg., Inc., 93 F.3d 1548, 1555 (Fed. Cir. 1996)* (quoting *State Indus., Inc. v. Mor-Flo Indus., Inc., 883 F.2d 1573, 1581 (Fed. Cir. 1989))*. In examining the totality of the circumstances the court should consider

> 1) the infringer's deliberate copying of the ideas [*163] of another; 2) the infringer's knowledge of the patent rights of another; 3) any good faith belief of invalidity or non-infringement formed by the infringer after an investigation of the patent rights of another[;] and 4) the infringer's behavior as a litigant.

E.I. duPont De Nemours & Co. v. Monsanto Co., 903 F. Supp. 680, 740 (D. Del. 1995), aff'd, *92 F.3d 1208 (Fed. Cir. 1996)*. In the instant action, Ajinomoto bears the burden of proving by clear and convincing evidence that ADM acted willfully in infringing the *'765* patent. See id.

10. It is undisputed that ADM had knowledge of Ajinomoto's *'765* patent rights when it acquired the ABP strains. (PP 97-98, 103) ADM also was aware at the time of purchase that ABP had acquired the Genetika technology, specifically the strain G472T23(pYN8). (P 110) At no time did ADM seek an opinion of counsel with respect to the ABP strains and their possible infringement of the *'765* patent rights.

11. [HN41] Actual notice of another's patent rights imposes an affirmative duty of due care upon the potential infringer to avoid infringement. See *Jurgens, 80 F.3d at 1570*. This duty includes "seeking and obtaining competent legal advice [*164] before engaging in activity that may result in infringement." *Stryker Corp. v. Intermedics Orthopedics, Inc., 96 F.3d 1409, 1414 (Fed. Cir. 1996)* (quoting *Electro Med. Sys. S.A. v. Cooper Life Sciences, 34 F.3d 1048, 1056 (Fed. Cir. 1994))*. There is, however, no "absolute requirement that a would-be defendant aware of another's patent obtain its own opinion letter in order to immunize itself from a finding of willful infringement." *Hall, 93 F.3d at 1555*. Instead, a court must look to the totality of the circumstances in determining whether an infringer discharged the duty of due care. See *Monsanto Co., 903 F. Supp. at 742*.

12. Based upon its review of the totality of the circumstances, the court concludes that Ajinomoto has not satisfied its burden of establishing by clear and convincing evidence that ADM willfully infringed the *'765* patent. As noted, although ADM's failure to seek an opinion of counsel is an important factor to consider, it is not dispositive. The evidence of record indicates that ADM had a good faith belief, based upon representations made to it by ABP's Dr. Skogman, that the Genetika-ABP agreement allowed ABP to export into the United States the "modified" [*165] threonine technology it had developed from the Genetika strains. (PP 90, 114, 121) This belief is bolstered by the fact that Genetika had knowledge of ABP's sale of the technology through Dr. Debabov yet never protested the sale. (P 121) In addition, as evidenced by the voluminous record developed during this litigation, ADM put on a substantial challenge to the existence of infringement and to the validity of the *'765* patent. Accordingly, the court concludes that Ajinomoto is not entitled to an enhanced damages award.

13. Likewise, the court declines to find that this case is an "exceptional case" under *35 U.S.C. § 285*. [HN42] Section 285 provides that "in exceptional cases [the court] may award reasonable attorney fees to the prevailing party." The purpose of this section is to compensate "the prevailing party for its monetary outlays in prosecution or defense of a suit where the conduct of the losing party is clearly inequitable." *Multi-Tech, Inc. v. Components, Inc., 708 F. Supp. 615, 620 (D. Del. 1989)*. The Federal Circuit has broken the standard down into four parts:

> (1) the case must be exceptional; (2) the district court may exercise its discretion; (3) the fees must [*166] be reasonable; and (4) the fees may be awarded only to the prevailing party.

Machinery Corp. of America v. Gullfiber AB, 774 F.2d 467, 470 (Fed. Cir. 1985). In general, for a case to be deemed exceptional there must be some finding, by clear and convincing evidence, of unfairness, bad faith, inequitable conduct, vexatious litigation, or some similar exceptional circumstances. See *Advance Transformer Co. v. Levinson, 837 F.2d 1081, 1085 (Fed. Cir. 1988); Stevenson v. Sears, Roebuck & Co., 713 F.2d 705, 713 (Fed. Cir. 1983); Multi-Tech, Inc., 708 F. Supp. at 620*. In the instant action, the court concludes that Ajinomoto has not satisfied its burden of establishing by clear and convincing evidence that ADM's actions make this case an exceptional one. Accordingly, the court shall deny Ajinomoto's request for attorneys' fees.

C. Prejudgment Interest

14. The Supreme Court has held that, [HN43] when infringement is found, prejudgment interest should be awarded absent some justification for withholding such an award. See *General Motors Corp. v. Devex Corp., 461 U.S. 648, 657, 76 L. Ed. 2d 211, 103 S. Ct. 2058 (1983)*. Specifically, the Court stated that given the [*167] "overriding purpose of affording patent owners complete compensation," an award of prejudgment interest is ordinarily warranted since

> in the typical case an award of prejudgment interest is necessary to ensure that the patent owner is placed in as good a position as he would have been in had the infringer entered into a reasonable royalty agreement. An award of interest from the time that the royalty payments would have been received merely serves to make the patent owner whole, since his damages consist not only of the value of the royalty payments but also

> of the forgone use of the money between the time of infringement and the date of judgement.

Id. at 655-656 (footnote omitted). Thus, the court must determine which rate of interest will best compensate Ajinomoto for the time value of money.

15. [HN44] District courts have great discretion in the selection of interest rates and may award interest at or above the prime rate. See *Uniroyal, Inc. v. Rudkin-Wiley Corp., 939 F.2d 1540, 1545 (Fed. Cir. 1991)*. In the instant action, Ajinomoto asserts that an appropriate interest rate is the three-month U.S. Treasury Bill rate. Ms. Davis used this rate when calculating [*168] prejudgment interest in her report. (PX 417, Ex. 7-1) The court, in its discretion, agrees with the parties that the prevailing three-month U.S. Treasury Bill rate is the appropriate rate for determining prejudgment interest.

D. Injunctive Relief

16. Ajinomoto seeks a permanent injunction enjoining ADM from infringing the *'765* patent. [HN45] Pursuant to *35 U.S.C. § 283*, this court is authorized to "grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable." Although the grant of an injunction is discretionary, generally courts will grant injunctive relief when infringement has been determined. See, e.g., *W.L. Gore & Assocs., Inc. v. Garlock, Inc., 842 F.2d 1275, 1281 (Fed. Cir. 1988)*. The Federal Circuit has indicated that once a finding of infringement has been made an injunction should issue absent a sufficient reason for denying it. See id. That the injunction might put the infringer out of business does not justify denial of the injunction. See *Windsurfing Int'l, Inc. v. AMF, Inc., 782 F.2d 995, 1003 n.12 (Fed. Cir. 1986)*. Accordingly, the court will grant a permanent [*169] injunction preventing ADM from infringing the *'765* patent.

IV. CONCLUSION

For the reasons discussed, the court finds that in using strains G472T23(pYN8), G472T23(pYNSTOP), and G472T23(pYNTE2) defendant ADM has infringed claims 1 and 2 of the *'765* patent in violation of *35 U.S.C. § 271*(g). Further, the court finds the *'765* patent valid and enforceable under *35 U.S.C. §§ 102* and 103. As a result of the finding of infringement, Ajinomoto is entitled to a permanent injunction preventing ADM from infringing claims 1 and 2 of the *'765* patent. In addition, Ajinomoto is entitled to money damages to be calculated based upon a royalty rate of $1.23/kg of threonine sold by ADM since May 1993, plus prejudgment interest at the three-month U.S. Treasury Bill rate. Judgment shall be entered accordingly.